The 23rd Annual Conference
of the Australasian Society for Computers in
Learning in Tertiary Education

Who's Learning? Whose Technology?

3–6 December 2006
The University of Sydney
Sydney, Australia

PROCEEDINGS

Volume 1

Editors: Lina Markauskaite, Peter Goodyear, Peter Reimann

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The papers in this book comprise the proceedings of the 23rd Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education “Who’s Learning? Whose Technology?” Volumes 1 and 2 of the proceedings include selected full research papers. All papers are original, peer-reviewed and based on the research originally disseminated at the meeting. Papers presented at this annual scientific conference reflect the state of the art of research and development in the area of computer supported learning in tertiary education in the Australasian region. The selection of scholarly papers for presentation and publication was based on the outcomes of a rigorous peer review process. Papers reflect the authors’ opinions and their inclusion in this publication does not necessarily constitute endorsement by the editors. The Appendix comprises other selected conference materials: keynotes, special sessions, symposia, poster presentations and workshops, which are not full scientific papers.

The 23rd Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education
"Who's Learning? Whose Technology?"
3–6 December 2006, Sydney, Australia

Organised by

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Contents

Editorial: Who's learning? Whose technology?

Lina Markauskaite, Peter Goodyear, Peter Reimann
The University of Sydney

The annual conferences of the Australasian Society for Computers in Learning in Tertiary Education (ascilite) bring together delegates with research interests in the broad area of educational technologies, computer-supported learning and tertiary education. This year's conference theme is: *Who's learning? Whose technology?* Conference presenters were encouraged to address one or both these topics by considering some of the questions outlined below, as well as by offering their own interpretations of key issues.

Who's learning?

How well do we know our students? How can we ensure we meet learners' real needs and not what we imagine they might need? What do they actually do with all this 'neat stuff'?

Learning by individuals, groups and teams. Design for individualised learning is different from design for learning teams and learning communities. Flexibility for the individual and collaboration can be competing goals. How could we reconcile them? Are there good ways of assessing the work of virtual teams and individuals?

The needs of the iPod/iLife generation – and an aging and diversifying student population. We are hearing more about the characteristics, habits and demands of the iPod generation – and we need to respond to their expectations – but the student population is older and more diverse than it was 10 years ago. How can podcasting, social technologies, design for diversity and/or other technological, design and pedagogical innovations meet different learning demands?

What are teachers learning? Organisations? The higher education sector? We are not just interested in what students learn. What are teachers learning about new ways of teaching? What are their conceptions of learning with technology? How are they coping with the intensification of academic work? What can we say about organisational learning or learning across the whole of higher education, especially with respect to smarter use of educational technologies?

Who's learning from research? Good research is all very well, but who is learning from it and how? How do we know? How do we improve the impact of our research and demonstrate that it has effects?

Whose technology?

How can we plan the articulation of personal and organisational technologies? Fifteen years ago the challenge for tertiary education institutions was to provide enough computer labs. Now it is equipping smart learning spaces and providing wireless access. As personal technologies become more mobile, ubiquitous and powerful, where will the boundary be between what the institution provides and the learner brings? How are higher education institutions addressing this challenge? What strategies might they adopt? What do reports from foresight or horizon scanning exercises tell us about the future? Do we have successful examples that illustrate the possibilities of integrating mobile personal technologies with smart learning spaces?

User and activity-centred technology design. Research and development help us to move towards a user-centred and/or activity-centred educational technology. How far have we advanced in this research area? What successful examples illustrate our current achievements?

E-learning, e-teaching or e-management? Some of what goes under the name of e-learning is really e-management or e-administration. Some of it is e-teaching. How much is really about learning? Do we have good research and development examples that celebrate the best of e-learning? What can we learn from critiques of current practice?

Technology in whose image? Technology design ‘constructs the user’. What kind of users do we imagine, value and serve? How do we know? What can we do to surface our assumptions about learners and learning?

These contemporary challenges and issues are addressed in the research papers presented at the annual ascilite conference.

Review process

The conference program chairs established two committees: an international scientific committee and a local program committee.

The international scientific committee (board of reviewers) was composed of 103 people with expertise in the area of computer-supported learning and tertiary education. The members came from 11 different countries, with personnel drawn from 25 Australian universities and 17 universities from other countries. The members of the international scientific committee provided academic advice and helped to review and select the best research papers for presentation at the conference. The local program committee, composed of researchers from several Australian universities, helped with program planning, editorial and other program-related matters.

We received 180 papers (108 – full and 72 – concise) and 14 posters from 17 countries. All full and concise papers were peer reviewed in a double-blind review process by the international review team. Each paper was reviewed by at least three reviewers selected from the international board of reviewers. To achieve consistency, reviewers were provided with a *Reviewer’s Guide* and detailed assessment criteria. Reviewers’ comments were then considered by the program chairs. The papers with positive recommendations from at least two reviewers were further reviewed by the program chairs and, if necessary, after additional consultation with the members of the international scientific committee, the best contributions were selected for presentation at the meeting. The overall acceptance rate for refereed papers was just above 65%: 81% in full and 54% in concise paper categories. The only criterion that was used for selection of papers was that of quality and scientific merit.

The international review team provided detailed, formative feedback for the authors. This enabled many good papers to be further elaborated and improved. A subset of the local program committee worked with the authors of accepted papers helping them to address reviewers’ comments, check that review recommendations had been dealt with appropriately and generally improve the quality of their papers. Only those papers that successfully passed all stages of the review and academic editing process are published in these proceedings.

To achieve balance between quality and immediacy, some proposers of full and concise papers that reported innovative research in early stages of development, work in progress or initial outcomes of ongoing research were offered a chance to present their results at the ascilite 2006 poster sessions.

The main results of the paper review process are summarised in the table below.

Category	Refereed	Submitted	Full papers		Concise papers		Posters		Rejected
			Accepted	Presented	Accepted	Presented	Accepted	Presented	
Full papers	Yes	108	71	67	17	15	13	4	7
Concise papers	Yes	72	–	–	39	38	23	12	10
Posters	No	14	–	–	–	–	14	14	0
Total		194	71	67	56	53	50	30	17

The final scientific conference program consists of 120 refereed scholarly papers: 67 papers are full (10–12 pages) and 53 papers are concise (4–6 pages). These research papers are published in the Conference

Proceedings and will be presented for the first time during the meeting, 4th–6th December 2006, in 34 paper sessions and two symposia (30 minutes for each full paper; 20 minutes for each concise).

Additionally, two keynote, three special and two poster sessions (comprising of 30 poster presentations) will be held during the conference. Prior to the main conference program (on 3rd December, 2006), all conference delegates will have a chance to attend one or more of 11 workshops that were selected from 14 proposals. Summaries of these non-refereed contributions are published in the appendix to the Conference Proceedings.

We are pleased to note that the standard of research presented at the ascilite 2006 conference is very high. Participation from international researchers from the region and from other countries is also especially strong this year. We are confident that ascilite 2006 will be an important landmark in the field, providing a useful overview of the state of the art, and of emerging research themes and issues.

This would not have been possible without the assistance of a large team of people, many of whom are named in these proceedings, though others have also been working behind the scenes. We want to take this opportunity to thank many friends and colleagues who have assisted in the process, including the ascilite executive (led by President, Cathy Gunn), the sponsors and exhibitors, local organising committee, program committee, international scientific committee, conference helper team, keynote speakers, workshop organisers, convenors of symposia and special sessions, presenters and delegates. Our special thanks go to Mandy Newton, who has been the mainstay of the conference organising team, and of CoCo in its first three years.

The University of Sydney, AUSTRALIA
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Volume 1

Research Papers

The use of a visual learning design representation to document and communicate teaching ideas

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A learning design is a representation of teaching and learning practice documented in some notational form so that it can serve as a model or template adaptable by a teacher to suit his/her context. This paper presents a work-in-progress of a research study that is examining how a learning design representation developed in an Australian federally funded project known as the Learning Designs project (www.learningdesigns.uow.edu.au) is being used. Eleven participants were interviewed to investigate how they are using the learning design representation and how such a representation could be improved. Preliminary findings indicate that the visual characteristic of this learning design representation is one of its main strengths. The visual element enables a learning design to be summarised so it can serve as a "talking point" during the design process, it can be used as a communication device to share pedagogical strategies, and it can also serve as a personal reflection tool. In-depth analysis of the interviews is currently being conducted. The results will inform the refinement of the learning design representation and make a contribution towards the development of a notation system as there is currently no consistent notation system for learning designs in education.

Keywords: learning design, learning design representation

Introduction

In the Higher Education sector where Information and Communication Technology (ICT) is becoming mainstream, teachers are faced with an ongoing challenge to review their teaching practices. There is an agenda to improve the overall quality of teaching and learning based on contemporary views of learning and integrate Internet technology within teaching practice (Transcript of the Launch of the Carrick Institute for Teaching and Learning in Higher Education, 2004). This has led to a situation where there is a growing demand for advice and guidance in a time-efficient and effective form so that teachers can implement innovative and pedagogically sound ideas. The current push to reuse existing learning resources via the use of learning objects, and more recent efforts to describe educational strategies in consistent notational forms, referred to as learning designs, are strategies that may encourage academics to implement different and innovative teaching practices.

There is a wealth of literature about effective educational strategies and descriptive case studies that illustrate how theory is translated into practice. This is documented in a range of genres, such as descriptive and analytical case studies reported in journal and conference publications, tips and techniques found in Web sites, pedagogical principles outlined in books, etc. There is, however, no consistent form to describe and represent these ideas. This makes the contrast and comparison of ideas difficult and time consuming. Goodyear (2005) concludes that the current ways of representing and sharing educational designs need improvement and argues for a mechanism to capture design knowledge in a way that bridges the gap between research-based evidence of pedagogical theory and practical application of that theory. Similarly, Waters and Gibbons (2004) state that a notation system for educational design, similar to that found in other disciplines, such as music and dance, is needed to provide a common language that will allow better communication of ideas, and in turn could serve as a stimulus to improve the quality of teaching and learning.

Learning design representations

A learning design is a representation of teaching and learning practice documented in some notational form so that it can serve as a model or template adaptable by a teacher to suit his/her context. The use of learning designs to share and model expert practice would not eliminate the need for academics to have an understanding of contemporary learning theories and their applications. Instead, it would provide academics with a scaffold to help them design high quality learning environments without investment of excessive amounts of time.

Currently, there is no consistent notation system for learning designs. Richards and Knight (2005) and McAndrew, Goodyear, & Dalziel (2006) describe several emerging learning design representations. Examples include design patterns (e.g., Goodyear, 2005), pedagogical patterns (e.g., http://www.pedagogicalpatterns.org/), learning activities (http://www.lamsinternational.com/), and the technical specification IMS LD (http://www.imsglobal.org/learningdesign/index.html). These representations are documented in a range of forms such as textual descriptions, flow charts, and computer readable language.

Another emerging learning design representation was developed from a project funded by the former Australian Universities Teaching Committee referred to as the Learning Designs project (http://www.learningdesigns.uow.edu.au) (Agostinho, Oliver, Harper, Hedberg, & Wills, 2002). The Learning Designs project focused on the development of generic learning designs, based on exemplary teaching and learning practice in higher education supported by information and communication technology. The site includes five generic learning design guidelines, four generic learning design software tools and 32 contextualised learning design exemplars and has been heralded as one of the most extensive Web based resources in higher education available (Hicks, 2004). A learning design representation was devised to illustrate the learning designs in terms of the tasks students are required to undertake, the content resources students are provided with to assist them in completing the tasks and how the teacher plans to help or support students through their learning process (Oliver & Herrington, 2001). The representation includes a graphical formalism that assigns symbols for each of the three learning design elements (squares/rectangles for tasks, triangles for resources and circles for supports) and delineates these symbols in a chronological sequence. Figure 1 provides an example of the visual learning design representation. The suggested time period for the learning design and intended learning outcomes are also included.

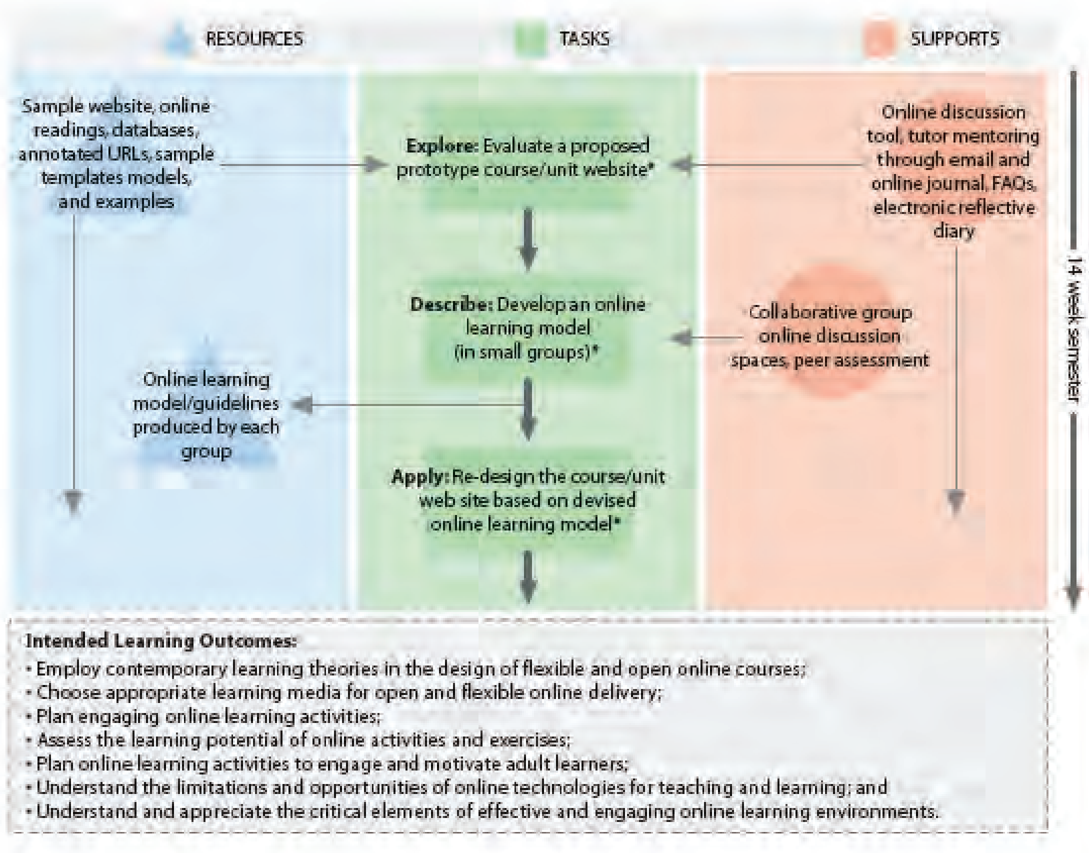

Figure 1: Example of the visual learning design representation devised in the Learning Designs project (Herrington & Oliver, 2002)

On the project web site, this visual is accompanied with rich textual information to explain each aspect of the learning design and provide guidance on how it can be implemented.

Whilst there has been some research conducted into how the learning designs from the Learning Designs project could be reused (Bennett, Agostinho, & Lockyer, 2005; Bennett, Agostinho, Lockyer, & Harper, 2006), little is known about whether this graphical learning design representation is being utilised beyond the project and if so how. Thus, the aim of this research was to conduct a small exploratory study to investigate how the learning design representation is being used, what is its perceived usefulness and limitations and what refinements are required to improve the representation.

Research approach and preliminary findings

The researcher (author) was the project manager for the Learning Designs project and was heavily involved in the development of the learning design representation. Through ongoing work and communication with several members of the project, she identified that the visual learning design representation is being utilised by several teaching academics and staff development academics across several Australian universities. These academics were approached to participate in this study. Interviews were conducted, both face-to-face and via telephone with the following key questions asked:

- Does the graphical representation help you to understand a learning design in a time-efficient manner?
- How have you used this learning design representation?
- What suggestions would you recommend to improve the learning design representation?
- Do you know of other colleagues that are using this learning design representation?

Some participants knew of other colleagues that were also using the learning design representation, thus these academics were also requested to participate in this study.

In total, eleven interviews were conducted with participants spanning four university institutions. The interviews were reviewed using a data analysis technique referred to as "skimming the cream" (Smith, 1978), where the researcher reflected on the interview data and brainstormed the predominant themes that emerged.

Preliminary findings indicate that the learning design representation is being used as a mechanism to describe and document teaching ideas in the form of a learning design. The visual characteristic of the learning design representation is a significant strength that aids the documentation and communication process. Because the learning design can be summarised graphically, participants stated different ways in which they use the learning design representation. These include:

- A tool used during the design process of a course/subject/activity to communicate and discuss pedagogical ideas.
- A documentation device to summarise and communicate a learning design implemented in a course/subject.
- An analysis tool to reflect on an implementation of a course/subject.

The representation's underlying structure of tasks, resources, and supports was seen as a useful mechanism to focus on the tasks students are required to complete and delineate the content resources to be provided to help students complete the tasks and how they are to be supported in the learning environment. The other significant feature deemed effective is the chronological sequencing of tasks as this explicitly illustrates the order of tasks in the learning design.

In-depth analysis of the interviews is currently being conducted. It is envisaged that the results will identify the characteristics required by a representational model that enable a learning design to be understood by a teacher, thus contributing towards the development of a notation system for learning designs to facilitate their dissemination and reuse.

Conclusion

This paper has presented a work-in-progress of a study that is investigating how the learning design representation devised by the Australian Learning Designs project is being used. This research is timely as there is no consistent form for describing and representing a learning design. McAndrew, Goodyear & Dalziel (2006) argue that it is an appropriate time for reflection on current representational forms to determine how sharing can be best facilitated amongst teachers and designers. The findings from this study will contribute to this dialogue. The findings will also feed into the research work of the awarded Australian Research Council Linkage grant titled: “Improving university teaching: Creating strategies and tools to support the design process”.

References

Agostinho, S, Oliver, R., Harper, B., Hedberg, H., & Wills, S. (2002). A tool to evaluate the potential for an ICT-based learning design to foster "high-quality learning". In A. Williamson, C. Gunn, A. Young., & T. Clear (Eds.), *Winds of change in the sea of learning. Proceedings of the 19th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education.* (pp. 29-38). Auckland, New Zealand: UNITEC Institute of Technology.

Bennett, S., Agostinho, S., & Lockyer, L. (2005). *Reusable learning designs in university education.* In T.C. Montgomerie, J.R. Parker (Eds.). Proceedings of the IASTED International Conference on Education and Technology (ICET 2005), Calgary, Alberta, Canada, pp. 102-106.

Bennett, S., Agostinho, S., Lockyer, L., & Harper, B. (2006). Supporting university teachers create pedagogically sound learning environments using learning designs and learning objects. IADIS International Journal on WWW/Internet, 4(1), 16-26. Retrieved [July, 2006] from http://www.iadis.org/ijwi/

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australian Journal of Educational Technology,* 21(1), 82-101.

Hicks, O. (2004). Composite Report on Projects Funded Through the Australian Universities Teaching Committee 2000-2003. Australian Universities Teaching Committee. Retrieved, 2 November 2004, from www.autc.gov.au/projects/ completed/AUTC_funded_projects_00-03.pdf.

McAndrew, P., Goodyear, P., & Dalziel, J. (2006). Patterns, designs and activities: Unifying descriptions of learning structures. *International Journal of Learning Technology*, 2(2/3), 216 – 242.

Oliver, R., & Herrington, J. (2001). *Teaching and learning online: A beginner’s guide to e-learning and e-teaching in higher education*. Edith Cowan University: Western Australia.

Herrington, J. & Oliver, R. (2002). *Description of Online teaching and learning (Edith Cowan University Online Unit IMM4141 in Graduate Certificate in Online Learning).* [Online]. Retrieved September 19, 2006, from Learning Designs Web site: http://www.learningdesigns.uow.edu.au/exemplars/info/LD20/index.html

Richards, G., & Knight, C. (2005, 26 January). Learning design and representations of instructional intent. *UNFOLD* Retrieved 5 April, 2005, from http://www.unfold-project.net:8085/UNFOLD/about_folder/events/online/griff/paper/.

Smith, L. M. (1978). An evolving logic of participant observation, educational ethnography, and other case studies. *Review of Research in Education*, 6, 316-377.

Transcript of the Launch of the Carrick Institute for Teaching and Learning in Higher Education (2004). [Online] Retrieved, September 25, 2006 from http://www.dest.gov.au/Ministers/Media/Nelson/2004/08/n853110804.asp

Waters, S. H., & Gibbons, A. S. (2004). Design languages, notation systems, and instructional technology: A case study. *Educational Technology, Research and Development,* 52(2), 57-68.

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Whose technology enables learning through discussions? The 'shoutboard': A new design for asynchronous discussions

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The literature confirms that learning occurs through discussions. However, the question of 'how' discussions are conducted in an online environment continues to challenge educators. Technology has recapitulated a discussion approach to aid learning by building tools to enable discussions between multiple users. There appears to be a short supply of research which considers whether these current technologies used in the common Learning Management Systems (LMS) and computer conferencing (CC) enhance or limit learning. The cognitive processing required of learners when they engage in the common threaded messages on many of the LMS platforms, is laboured and cognitively demanding. The structure and content appears to be driven by the need for e-management and e-administration, relegating learning to a secondary position. This paper discusses the psychological reading process and how, if used to drive the technology, the reading and processing of content within discussions may be accessed more easily and expanded to include debate and compare and contrast focussed discussions, thus minimizing the cognitive work required for reading posted discussions. The level of interactivity and sociability is also examined. The rationale, development, trial and evaluation of the 'shoutboard' are reported.

Keywords: online learning, discussions, cognitive processing

Background

Never has the need to find efficient ways to enable learners to interact with information systems and each other been so important than at the present time– the Information Age. Learning through and with interactions is not new as it was fundamental to Socrates and in later centuries to the theories of Vygotsky and Piaget. However, the application to sources such as technologies is relatively new. Their theories have been applied to teaching and learning in classrooms over the decades and have influenced indirectly, designs for online learning. Cooperative and collaborative learning strategies emanating from these theories have been applied to enhance conversing and interacting and ultimately learning.

There has been a strong movement to imitate or replicate classroom interactions in which learning occurred to the online environment. Chat rooms, discussion forums, threaded and unthreaded discussions have been included in the now decade old LMS of WebCT and Blackboard to promote 'talk' and preferably critical thinking as a means to learning (Coffin, Painter & Hewings, 2005; Hara, Bonk & Angeli, 1998). Such discussion forums require the mechanisms to initiate, facilitate, conclude and provide feedback. Hara et al. found that "there was never a sense of real heated or seminal online discussions with students negotiating meaning, taking sides on issues, or coming to compromise" p.26. They argue for improved pedagogy to motivate students' participation at this level. Dennen (2005) analysed nine different online classes in the search for the effect different discussion activities impacted on quantity, quality, timing and the nature of messages. Harasim (1989) (cited in Marra) describes interactivity as the most striking characteristic of Computer Mediated Conferencing and the factor with the greatest potential to impact on learning. Further, the research on instant messaging (Lewis & Fabos, 2005) and how the insight it provides into how messaging is negotiated and understood, may contribute to the motivational aspect of online discussions.

The LMS platforms have included features which enable teachers to: track student’s contributions – frequency and length over a period of time; ascertain the date messages are posted; identify read and unread messages; and to moderate discussion messages by deleting inappropriate messages. It is clear that the familiar structuring of threaded and unthreaded, read and unread messages and the way these discussions visually appear and are used reflect the need of e-management of students and assessment. Academics want to know who makes a contribution and whether the contribution was worthwhile, so marks can be allocated. It appears the LMS discussion tools component is being used complete with limitations possibly in the belief it will, simply by employing it, enhance learning: a critique of the system is absent in the literature. The use of the systems as shells waiting to be filled (Winn, 1992) emphasises content at the expense of activity and message design, a point reflected in the research of Holmes (2004). The authors of this paper support the idea of deliberate asynchronous message design with the development and trialing of their approach reported in this paper. There is extant literature reporting on the various analyses to identify the educational or learning effectiveness of online discussions, particularly asynchronous (Holmes, 2004) but there appears to be no research on the comprehension afforded by these same messages, or by varying message approaches, to the readers.

We have challenged the current message functionality and the power of these to a) promote higher level thinking through engagement and interactivity and b) to enhance the learning outcomes for students. It appears academics are devising multiple ways to engage learners in these linear and asynchronous discussions, and to engage them at deeper and higher cognitive levels (Thomas, 2006; Coates, James & Baldwin, 2005; Dennen, 2005; Hara, Bonk, Angeli, 1998) without critiquing the functionality of the discussion forums to achieve interactivity, learning, understanding and knowledge. Based on theories of comprehension and reading we took up this critique and asked if there were alternative structures to improve the cognitively demanding task of comprehending across many messages to arrive at higher thinking, synthesis and challenge. Readers have to manage their limited working memory capacity to process the many messages, to filter the unimportant and distracting detail often in the headers of messages, scan and obtain coherence. Reading online in this way may require different cognitive processes, or maybe the structuring of messages can better represent the already learned linear processes for obtaining meaning from text. Is the process of linearity in traditional text a constraint in adapting to the need to interact with information in a nonlinear way? Is one approach more suitable for particular learning approaches than others, or more suitable to young versus mature students?

Literature review

The need for a system development of messages in discussion forums is essential. Ways to promote interaction between readers and text should prevail in any online facilitation of learning. The quality of display, number, shape, location of windows, window width, navigation tools, colour, length etc., can vary and ultimately affect flow and coherence of reading and comprehension. Effectiveness and quality must be of educational relevance: Usability and learnability are two sides of the same coin. Studies in hypertext structures (Britt, Rouet & Perfetti, cited in Rouet, Levonen, Dillon & Spiro, 1996) identified a reader’s need for coherence and top-level representations. As messages and discussion postings presented in LMS have similarities in their hierarchical presentation and user controllability to hypertext, it is believed readers of messages also desire features which promote coherence. Exactly what processing skills are needed, and if they can be taught, have not been determined through research.

The increasing emphasis and importance placed on information and communication in the future, extrapolates into a need for a similar emphasis of the same in Higher education degrees and programs. Based on the assumption that the cognitive approaches to reading hard copy text also apply when reading online, the ‘shoutboard’ was developed to address the limitations of linear approaches online and utilise the best of nonlinear approaches. Reference to the reading process it (Tzeng, van den Broek, Kendeou & Lee, 2005) indicates we may not be enhancing learning, but limiting it. When reading is done in the hard copy world, people have the freedom to read how they want to and not be controlled by an external system. For instance, the reader can go anywhere to anywhere; from the first to the last page, and back and forth among paragraphs while all the while building a coherent representation of the information. Effective and efficient readers exploit this freedom. In comparison, readers of messages and discussions in online environments have to open/close each topic thread and have no visual representation of where the information contained in various messages is taking them. There appears a loss of freedom, something which will be examined in the method within the ‘shoutboard’ . What may appear as contradictory to the above is that in the latter, readers have to make decisions about what it is they want to read. Do they want to follow the points made by one particular person/s and reject those made by others? Do they want to open every message or only a sample? As individuals they choose how to build meaning but this may not necessarily equate with establishing coherence, which in itself is a cognitive load. To obtain meaning the reader needs to have a mental representation or structure of how the discussions may unfold – to know the structure seems more efficient than opening messages unaware of the content. This is in difference to passively following through a text and awaiting the 'important' part to emerge, and indeed in contrast to the purpose of the approach developed in this paper in which careful critical reading is required prior to making an informed and worthwhile response to the discussion.

Research into how hypertext influences learning and understanding has been conducted (Rouet, Levonen, Dillon & Spiro, 1996; Wenger & Payne, 1996). A study by Rouet et al. (1996) found readers benefit from moderate degrees of nonlinearity. For example, the need for such features as accessing definitions while reading. In contrast Dee-Lucas (1996) affirmed comprehension is a continuous process and warned interruptions could be harmful. In addition, hypertext readers experience disorientation and navigation problems. Foltz (1989) found users employed looping and flipping strategies to demonstrate this orientation. But even then, little reading was accomplished.

The conceptualization of the 'shoutboard' was informed by the research on hypertext and the reading process, which suggests that the provision of structural cues to the reader and the improvement of coherence of information help to reduce the heavy cognitive load (Wenger & Payne, 1996). Headings, connectives and other text organizers which facilitate comprehension (Rouet et al., 1996) were designed into the 'shoutboard' together with other flexible features as discussed later. The type of task and the motivation by students to engage in the discussion was noted in addition to cues. Attaining meaning is a difficult task in itself (Rouet et al., 1996) but readers are motivated to seek coherence when the text is complex. When many diverse learners contribute to a discussion board online such as in LMS, the level of coherence is likely to be low. Individuals need to read all postings to obtain knowledge of the discussion, to learn from it, and in turn contribute to further discussion. Readers have to know where they are in the discussion, where to go next, which message to review before moving on and to overall build a cognitive representation of the discussion. This is not to say all readers in discussions consciously develop a procedure such as this. Many do not. Strategic exploration of messages is one aspect of online discussions and learning by processing and finding meaning across all discussion postings is another. Learning cannot be assumed or taken for granted when a linear threaded design is used.

In addition to the features of cues and coherence, is the actual act of reading online. Reading from a screen has been found to be slower (Gould as cited in Rouet et al., 1996), less accurate (Wilkinson & Robinshaw, 1987 cited in Rouet et al., 1996) and more fatiguing (Cushman, 1986 cited in Rouet et al., 1996). Whereby these findings are somewhat outdated given the developments in software and hypertext they contain a message relevant to reading postings in discussion forums today. We believe it is better to err on the side that postings may impair processing of information than to ignore them and therefore address shortcomings in any new design. As noted by Dillon, "such issues are important because our theories of information use and human cognition are themselves shapers of future technologies" (Rouet, Levonen, Dillon & Spiro, 1996, p.27). Technological capabilities must be married with human abilities if we are to enhance learning.

When reading a linear text, processing occurs at many levels from low level of word recognition to high level of obtaining meaning. And, although a representation of the meaning can be attained differently by readers, it is the relatedness in which the information is presented that assists meaning making. A reader seeks a macrostructure, also provided by the task and headings. Readers have to make many inferences when reading text and may need to make many more when reading from different authors. When information is fragmented the reader is forced to make more inferences and hold information in memory, creating a heavy cognitive load and possible misinterpretation or reduced comprehension of the text. These issues have been considered in the 'shoutboard'. The sociability of messaging was considered in the design of 'shoutboard' from the position of motivation. The age of the students indicated friendships would be important as late adolescence is a time to be 'intimate' with friends. In contrast to this position, anonymity may be considered as a positive feature to enable honest contributions to be made without fear of being recognised.

The trialing of the ‘shoutboard’ was about testing the assumptions derived from theory in order to improve the outcomes from discussion online. The discussions above concluded that the available systems of discussion are not ‘real’ enough or matched closely enough to human cognitive processing and the e-learning must take priority over e-management of students. Dillon states ‘…learning as a goal…needs to be addressed at a task level where, indeed, aspects of information location, summarization of ideas, memory, and so forth, may be identified. Such tasks can be analyzed and subsequently supported technologically’ (p.33). It is from this position that education can proceed to truly enhance learning.

The ‘shoutboard’

It was affectionately called the ‘shoutboard’ to encapsulate the importance and value of each person’s message – one was encouraged to shout for all to ‘hear’, but the name was never replaced. It valued contributions of thought and de-emphasised personality and bias. Figure 1 provides a screen capture of the ‘shoutboard’.

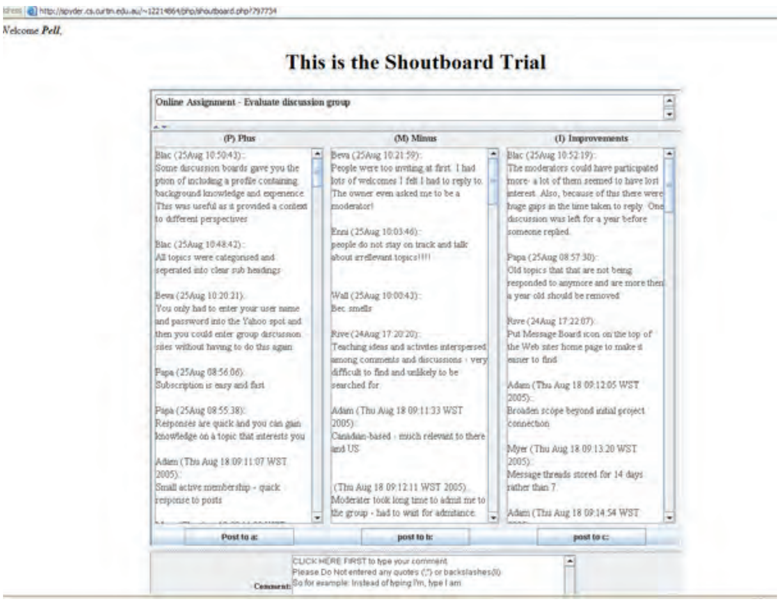

Figure 1: Screen capture ‘shoutboard’

The ‘shoutboard’ is conceptualised as a multiple column with independent scrolling space into which to post discussions. Each column is cued with a heading, minimising cognitive load, and readers can scan vertically and horizontally in accordance with their own approach to processing information. Coherence is obtained when readers post their message into any or several columns and readily access other discussion points at a glance or scroll movement. A reader can selectively browse sections/columns to build up a representation of the meaning and then jump to the next column. Column headings assist in developing coherence and the building of a representation of the discussion or debate. In addition, the function of scanning backwards and forwards or from column to column assists in reducing cognitive load.

One could surmise this simple navigational feature minimises cognitive load. As a learner’s point of view or knowledge (recorded in a response of the author’s choice) is challenged or supported by examples from the responses by others, the learner can use the views in each column to consolidate and learn. A reader chooses the path through the text postings and the time spent on each posting to establish user controllability.

The use of scrolling columns means that tasks can now be set that require higher cognitive processing, critical thought and deep learning. Tasks that ask for similarities, differences, advantages, and disadvantages can be given to students, thus advancing higher synthesis of information while at the same time maintaining coherence. Higher levels of thinking are possible if the cognitive load is decreased.

Despite its theoretical conceptualization it is the user which determines its functionality and assistance to enhance learning. The following section presents the initial findings of the 'shoutboard' trial.

Methodology: 'shoutboard' trial

The development of the 'shoutboard' software was the result of a special project that aimed to develop a tool to enhance debate, authentic, critical and reflective tasks within WebCT which better utilize cognitive learning and comprehension theory, in the reading and processing of written material using an open, but asynchronous collaborative structure. The project involved a number of personnel from the following sections of the University: WebCT team; Computer Science and IT project students and Department of Education staff. The project was broken into three phases: Development; Pilot implementation; and Implementation and evaluation. This paper reports on the final phase, the implementation and evaluation of the 'shoutboard' tool.

The 'shoutboard' was trialed in semester 2, 2005 with Education students (N=30) at Curtin University of Technology. Ultimately, this research project adopted a case study approach where the case was a cohort of students enrolled in an Educational Technology unit that meet once a week for a 2 hour workshop in a computer laboratory. The students were introduced to the 'shoutboard' tool at the beginning of the unit where they were informed of the trial and instructed in its use.

These students were in their second year of the course and were already very familiar with WebCT, so it seemed appropriate to provide a function housed within WebCT to enable debates and other structured tasks, which require reflective and considered asynchronous contributions to occur. The idea was based on class discussion/debates where a whiteboard is used by students to record their points of view, but facilitated by the lecturer. The role of the lecturer was to structure the task, set the format and mediate the contributions.

The role of the student was to enter a piece of information into a space at the time they decide to open and access WebCT. Further, the element of scanning all entries above or beside their own, to enable a synthesis of views was essential. This newly arrived synthesis may trigger other views. The reader used their prior knowledge and understanding to move between the information presented by the messages. In much the same way face-to-face discussions function, students examine the list, reflect, and offer their contribution. The major intention of the 'shoutboard' is critical appraisal. Instead of several students thinking the same thing and posting these, unaware that each has the same idea, as may happen in linear messaging, each student has to critically review those posted and come up with something new, or something not yet addressed. It was hoped that critical thought and problem solving skills would be further developed through such an online collaborative process and directed through the following three assessment tasks.

1. Online discussion groups

Find and subscribe to one useful educational online discussion group. You are required to provide evidence of participation in the discussion group and a written evaluation. As part of your report you need to provide clear details about: The name of the group

- A written evaluation – you are required to evaluate the discussion group. Complete a PMI – Positive, Minus and offer comments about how you could improve the quality of the discussion. To do this go to the 'shoutboard' icon on WebCT, and add your comments to the respective labeled columns. You will notice these will grow in size. Post early to be assured of original comments. Be aware that if you post last other members will have come up with most of the ideas. Read through all of the comments and from these develop your written evaluations of discussion groups in general or your own discussion group.

2. Technology investigation

For this assignment you must investigate a school's technology situation using the Framework for Learning Technologies given in class. Your task will be to document your specific school's current status and progress according to this document. Once you have visited your school, use the 'shoutboard' (three columns) to include comments regarding: Planning; Integration & Use; and Staff Capabilities. You will have only a one week timeframe to add your comments. In light of the comments made in the 'shoutboard' conclude your report with a summary of your findings and recommendations for your particular school. Use the 'shoutboard' to help you make final conclusions. In essence, the ‘shoutboard’ comments should help you to compare schools. Remember, the ‘shoutboard’ is used as a databank – a resource. Your comments need to be brief and informative of your specific school.

3. WebQuest

Your task is to design an integrated program of work which is solely introduced to the students through the structure of a WebQuest (inquiry based instructional tool). It is vital that you use the following structure for your WebQuest: Introduction (The Question*, Background Information, Resources); Task/Individual Roles; Process (Group Process); Resources; and Conclusion.

*The design of your Question for your WebQuest is one of the most crucial elements of your WebQuest. Once your group has devised your question use the ‘shoutboard’ to obtain feedback from your colleagues. Your group must:

- Post your question in one column
- In the second column, identify how this is a suitable question for a WebQuest.
- Each group must respond to two questions by adding their comments in the third column. The aim is to provide valuable feedback on the potential of the actual question for a WebQuest. A question is deemed to be completed when two responses have been made to that question. The ‘shoutboard’ will be closed by a given date.

All Education students in the unit were required to participate in each of the tasks. A separate ‘shoutboard’ was specifically created for each task. At the end of the semester the students were asked to complete a ‘shoutboard’ Evaluation. The findings were analysed using a coded content analysis and frequency counts which provided valuable information regarding the future use of the ‘shoutboard’. The following section presents the results of this survey.

Results and discussion

The survey attempted to focus on three key areas of the ‘shoutboard’ tool: cognitive processing; sociability; and functionality. The data for the questions pertaining to cognitive processing from the survey are presented in Table 1 as a percentage (N=30). Interestingly, the majority of the students (50%) identified that they ‘sometimes’ could easily scan for information to assist in their understanding, while 36.6% were able to ‘frequently/always’. Question 4 also attempted to identify whether students were able to cognitively process information without distractions or interference but according to these results 26.6% (never/rarely) of the students indicated that this was not the case. A further 53.3% noted that ‘sometimes’ searching for understanding seemed to flow without distractions or interference, while 20% noted this occurred ‘frequently’. Perhaps this also raises the extent of student’s awareness of the reading process and what they understood as interference.

Table 1: ‘shoutboard’ evaluation survey: cognitive processing (*N*=30)

	Cognitive processing	**Never**	**Rarely**	**Sometimes**	**Frequently**	**Always**
1	I was able to easily scan up and down and across and back searching for information to assist in my understanding.	**0**	**13.3**	**50**	**23.3**	**13.3**
2	I did not feel as though I was forced to follow a predetermined sequence of messages.	**13.3**	**13.3**	**40**	**20**	**13.3**
3	I controlled what information I would cognitively engage with.	**0**	**3.3**	**33.3**	**53.3**	**10**
4	Searching for understanding seemed to flow and be without distractions or interference.	**3.3**	**23.3**	**53.3**	**20**	**0**
5	I was able to read comments in one column and at any time move to another column.	**0**	**0**	**20**	**46.7**	**33.3**

As identified earlier, the issue of reader control or freedom can be restricted by management systems when reading online, thus affecting cognitive load. Questions 2, 3 and 5 attempted to determine whether the reader still maintained ultimate control while reading messages in the ‘shoutboard’ environment. The majority of students (40%) identified that they did not feel as though they were forced to follow a predetermined sequence of messages, while 33.3% felt that they could do so ‘frequently/always’. The data for question 3 clearly identifies that the majority (63.3%) of the students controlled the information they would cognitively engage with ‘frequently/always’. The issue of reader control was further supported when 80% of the students indicated that they 'frequently/always' read comments from one column and at any time moved to another column possibly indicating the search and need for coherence.

The students were also given the opportunity to provide additional comments where they were asked to identify a particular feature/characteristic of messages and the power of this feature/characteristic on learning specifically in relation to the WebCT and the 'shoutboard' environment. The following comments identified in Table 2 were categorized in relation to cognitive processing.

Table 2: 'shoutboard' evaluation open-ended responses: cognitive processing

Feature	WebCT threaded/linear message	'shoutboard' and multi processing messages
Ability to locate information	Easier to follow someone's argument	Can see a range of positive and negative and interesting arguments at once
	Messages follow from previous message	Hard to follow
	Clearly threaded	Cannot see which messages reply to another message
	Linking to other ideas is easy	No linking
	Related messages, opinions etc are easily identified	The nature of the 'shoutboard' means that if someone goes in another direction, the topic can still remain on the original focus
Layout	You have to scan through messages to find a topic	It is right in front of you, it is all a matter of scrolling
	Categorised according to student	Categorised in subject headings – clearer, quicker to sort
	Harder to follow messages	Easy to focus on a subject
	Hard to find a topic	Easy to find a topic
	Easier	Cognitively overwhelming at first
	Separate topics	Altogether, messy
	Good for keeping up to date	Not so good – sometimes confusing

Overall 12 students made comments regarding the cognitive processing of messages presented within WebCT and the 'shoutboard'. There appeared to be mixed views regarding the ease of following and comprehending messages in the 'shoutboard' environment. Some students appreciated the specific topic/subject/concept focus of the 'shoutboard' while others found it difficult to link ideas when there was no visual representation of which message replied to a particular message. However it was not apparent whether students were comparing the ability of both systems to track an individual's responses throughout the discussion or follow the main tenet of thought or argument. This same issue also impacted on the functionality of the 'shoutboard', addressed later in this paper.

As the 'shoutboard' was designed to replicate the essential features of face-to-face discussion or debate it was seen as important to track the sociability and interactivity of the 'shoutboard'. Table 3 presents the data from the 'shoutboard' Evaluation Survey with relation to the items that gauge sociability in the 'shoutboard'. Once again, 30 students were surveyed and the results are presented as a percentage.

Table 3: 'shoutboard' evaluation survey: sociability in the 'shoutboard'

	Sociability in the 'shoutboard'	Never	Rarely	Sometimes	Frequently	Always
6	The 'shoutboard' enabled me to interact well with others.	**6.7**	**36.7**	**40**	**13.3**	**3.3**
7	I learn from reading the comments and opinions of others.	**0**	**10**	**23.3**	**43.3**	**23.3**
8	Reading the comments by others made me review my own opinions and understandings.	**3.3**	**3.3**	**30**	**46.7**	**16.7**
9	The 'shoutboard' enabled me to better accept critical responses which I learned were not about me personally.	**6.7**	**16.7**	**36.7**	**30**	**10**
10	The interaction was enjoyable.	**3.3**	**33.3**	**36.7**	**20**	**6.7**
11	When others challenge my ideas I believe I learn more.	**3.3**	**0**	**20**	**60**	**16.7**
12	Writing messages in 'shoutboard' was an easily learned approach to focus my thoughts.	**6.7**	**13.3**	**26.7**	**36.7**	**16.7**
13	I valued the support of peers even when they disagreed with my idea, understanding or opinion.	**3.3**	**0**	**26.7**	**63.3**	**6.7**

The data for questions 7, 8, 11, and 13 clearly indicate that students value and learn from the type of interaction afforded to online forums. For instance (question 7), 66.6% identified that they 'frequently/ always' learn from reading comments and opinions of others, and (question 11) 66.7% noted that they ‘frequently/always’ learn more when others challenge their ideas. More importantly, question 8 reveals that 73.4% ‘frequently/always’ believe that reading the comments by others made them review their own opinions and understandings. This was one of the key aims of promoting the use of the ‘shoutboard’ with higher education students.

One would almost assume that interacting with a new environment without any technical glitches would be enjoyable. Question 10 revealed that 26.7% of the students ‘frequently/always’ enjoyed the interaction, while 36.7% enjoyed the interaction ‘sometimes’. Interestingly, 36.6% of the students ‘never/rarely’ enjoyed the interaction. Several reasons are postulated for this result. It was not determined how many do not enjoy learning at university irrespective of the form or mode of learning; how many do not enjoy using computers, or how many were late adolescents and mature students .It is possible late adolescence may desire discussions with their friends. We believe that the lack of enjoyment could also have been influenced by the nature of the tasks .The students were asked to interact with particular ideas/concepts not specifically to and with individuals. In previous units these students have been exposed to the WebCT environment where their experience with discussion boards would mainly have seen them reply to their friends’ messages – the interaction was much more social and usually always involved someone they actually knew. Perhaps this group of students could not personally engage with this process because they could not identify the individuals who actually posted the comments. The sequencing of and timing of postings may also have contributed. Unlike WebCT, if you posted an idea/concept in one of the columns of the ‘shoutboard’ the message would be seen at the end of all of the previous messages in that column and each message was identifiable by a brief codename that was only obvious to the lecturer. In addition students never knew if any new messages had been added since their last reading of the discussions.

Similarly, question 6 revealed that 43.4% of the students identified that ‘never/rarely’ did the ‘shoutboard’ enable them to interact well with others. Forty percent of the students noted that ‘sometimes’ the ‘shoutboard’ enabled them to interact well with others, while 16.6% rated ‘frequently/always’. Perhaps this is the expected trend as the idea was not to have a social chit chat but to think and process ideas at a critical level.

Table 4 presents the open-ended data identified in the survey relating specifically to the sociability element of the ‘shoutboard’. Students identified a feature and then addressed how each feature within the WebCT and the ‘shoutboard’ environment affected their learning. The number denotes the amount of times this comment was made.

Table 4: ‘shoutboard’ evaluation open-ended responses: sociability

Feature	WebCT threaded/linear message	‘shoutboard’ and multi processing messages
Interaction with others	Easy to interact with others (3)	Cannot interact directly with others i.e. Reply to a message (3)
Identification of a person	Very good and clear	Hard to find all posts by a particular person
Participation	People contribute to certain sections only	People contributed to each section. This gave me great feedback on my own perspectives.

Once again, many of the comments made by these five students support earlier data from Table 3, that students interact more with the content if and when they can actually directly respond to a particular message and when they know the identity of the person who made the comment. However they clearly identify the different purposes for each system: WebCT is more socially oriented and ‘shoutboard’ requires more processing if they wish to track personalities.

It was interesting to note the final comment made by one of the students in Table 4 – the student identifies that WebCT users contribute only to certain sections of the discussion/bulletin board, while in the ‘shoutboard’ students contributed to each section which provided this student with great feedback on their own perspective. Surely, this is what we are trying to achieve! One of the key questions for further investigation is which elements of the ‘shoutboard’ encouraged this, or was it directly related to the specific tasks set for the students? Student attitude and learning preference may also be reflected in the learning challenges presented by ‘shoutboard’. The final element examined in the ‘shoutboard’ Evaluation Survey was the functionality of the ‘shoutboard’. There has been a great deal of research (Bates, 2000; Deden, 1998) on the importance of technology usability and functionality and how this affects the uptake of the technology. Table 5 presents the data relating to the functionality of the 'shoutboard' obtained from the 'shoutboard' evaluation survey.

Table 5: 'shoutboard' evaluation survey: functionality

	Functionality	Never	Rarely	Sometimes	Frequently	Always
14	The multiple processing and non-linear approach was easy to use.	10	20	33.3	30	6.7
15	The freedom and flexibility of the 'shoutboard' made it easy to use.	6.7	20	36.7	26.7	10
16	Reading in the 'shoutboard' was more akin to reading information in a book than reading lists of messages.	16.7	30	20	26.7	6.7

The majority of the students (36.7%) identified that 'frequently/always' the multiprocessing and nonlinear approach was easy to use, while 33.3% found this to be 'sometimes'. A total of 30% of the students clearly had difficulty with the multiple processing and non linear approach. A similar pattern of response from the students was also obtained for question 15, where 36.7% identified that the freedom and flexibility of the 'shoutboard' made it 'frequently/always' easy to use. The final question of the survey asked the students to identify whether reading in the 'shoutboard' was similar to reading in a book rather than reading a list of messages – 36.7% identified that this was 'never/rarely' the case, while 33.4% found this to be 'frequently/ always'. The results support the purposes behind the development of the 'shoutboard'. However the responses for question 16 may be more to do with ambiguity and lack of clarity in the question than the outcome. Of course reading and manipulating multiple scrolling columns was not how one reads a book. The flexibility and reader controllability may be akin to reading a book, but the question did not seek this explicit understanding.

Table 6: 'shoutboard' evaluation open-ended responses: functionality

Feature	WebCT threaded/linear message	'shoutboard' and multi processing
Character Limit	Able to express ideas fully and to your best ability	Character limit constraints
Readability	Was easy to read and didn't get confused (5)	Was tricky to read eg. Font and italics (5)
Usability	Looks more professional and is slightly more intuitive in nature(2)	Format is not at all intuitive (2)
	Takes more time to post messages	Easier to post messages
Visual display	WebCT is more engaging (2)	Looks boring (2)
Inclusion of Time/date and student name	Breaks up each member entry and identifies entries	This feature was distracting
	Clearly see how many people have responded and clear separation of messages from different people – also includes dates/times	All text quickly follow on from one another, can't really see separation, who wrote it. Not much clear space
Access	Very easy to access from home, can see new messages posted (3)	Only able to access at Curtin, many screens to pass through (3)
Response time	A bit cumbersome but its not a problem	Good for immediate responses in discussions
Function	serves its purpose – keeps communication open	not the most functional
Flexibility	Operates well – maybe organised into class times	Could only use for a limited time

The open ended responses for functionality identified some valuable comments with which to improve the 'shoutboard': Fonts, access, identification of new postings, and being informed of new postings.

Conclusion

The most outstanding finding from this trial of the 'shoutboard' was that students were challenged in their critical and deeper thinking and they believed they were learning as a result. The students also thought that the 'shoutboard' tool was relatively easy to use but their main concern was that it performs the same functions as the WebCT discussion/bulletin board environment. It appeared they did not discriminate in the purpose of each system in the contribution to learning outcomes. The results challenge the idea of mental sets and their use in new and novel settings. Students tried to use the new technology 'the 'shoutboard' ' in the same manner as the technology they were already familiar with (WebCT). Thus, it is important for Academics and those involved in designing or using new technologies that require students to participate in online forums, to appreciate that students expect the same functionality as other Learning Management Systems and to moderate students through the procedures and outcomes of any new system. The students appear to want only one ‘size fits all’. This in itself tells us a great deal about our students in today’s climate. The new ‘shoutboard’ would have to encompass all of these functions, which is not entirely impossible as the improvements they noted can be added to ‘shoutboard’. We are now questioning the sequence. Would students have felt differently if they had been exposed to the ‘shoutboard’ prior to WebCT? This was clearly articulated by one of the education students in her survey: “I prefer to use WebCT because you can easily link comments and it is much easier to read. It was something we are more used to and easier to access”.

The survey data revealed that students value interacting with their peers in online forums and were able to identify how these interactions in the ‘shoutboard’ aided their own learning. As identified earlier, interactivity is the most striking characteristics in computer mediated communication and the one that has the greatest potential to impact learning according to Harasim (1989) (cited in Mara). If this is the case, then one could understand why the Education students found it quite frustrating not being able to directly reply to a particular argument/opinion/discussion. However there may be differences between engagement and interactivity which need further investigation when students participate in an online discussion tool.

The results identify some ambiguity as to whether coherence is achieved and whether it contributes to deeper learning. The cognitive load may be less, that is the process of building information mentally has decreased, but has this increased the planning and strategies the reader has to do before reaching understanding and arriving at this deeper level. Further research involving other disciplines and assessments may identify what factors promote effectiveness of the ‘shoutboard’ and for what kind of student and cognitive styles (adolescents, mature age, independent, dependent, creative, impulsive). The degree of moderate nonlinearity also needs further investigation. Is there a middle line between nonlinearity and linearity which is more effective?

The data revealed that the Education students engaged with the content within the ‘shoutboard’ environment at various levels. The ‘shoutboard’ attempted to present an alternative structure to improve the cognitively demanding task of comprehending across many messages, and the data revealed that most students found this structure valuable as it helped them to focus on specific concepts. Perhaps the limited number of columns (two or three) helped the students’ focus on specific concepts in comparison to a typical discussion board that could cover many concepts at one time. On the other hand, some students could not cope with so many messages at once and were overwhelmed by the sheer volume.

The data from the survey was unable to clearly identify whether the actual design of the ‘shoutboard’ helped to reduce the cognitive load often associated with reading online and especially given multiple sources. However, one thing is clear: we need to expose our students to a variety of online linear and non-linear texts in many different forms and provide them with strategies to work effectively in these environments such as promoting the use of some form of visual representation – mind/concept maps, matrix, grids etc. Whatever the process, technology capabilities must be married with human abilities. Further research questions have emerged: Is there a basic set of strategies / processes for reading online discussions and messages? Can a schema of macro-organisation of traditionally presented hard text be applied to obtain maximum efficiency in online-text? Can systems and learner focused approaches be better unified?

In summary, the ‘shoutboard’ was seen to be a valuable resource bank that enabled the students to add and store ideas, opinions and knowledge, which in turn because of the nature of the tasks given to the students forced them to synthesis these ideas to consolidate and formulate their own learning.

References

Bates, A. (2000). *Managing technological change: Strategies for college and University leaders.* San Francisco: Jossey-Bass Publishers.

Britt, N. A., Roue, J., & Perfetti, C. A. (1996). Using hypertext to study and reason about historical evidence. In J. Rouet, J. L. Levonen, A. Dillon & R. Spiro, (Eds.), *Hypertext and Cognition.* Mahwah, NJ: Lawrence Erlbaum Associates.

Coffin, C., Painter, C., & Hewings, A. (2005). Argumentation in a Multi Party Asynchronous Computer Mediated Conference: A Generic Analysis. *Australian Review of Applied Linguistics*, 19, 41–63.
Coates, H., James, R., & Baldwin, G. (2005). A critical examination of the effects of learning management systems on university teaching and learning. *Tertiary Education and Management*, 11(1), 19–36.
Deden, A. (1998). Computers and systemic change in higher education. *Communications of the ACM*, 41(1), 58–63.
Dee-Lucas, D. (1996). Effects of Overview structure on study strategies and text representations for instructional hypertext. In J. Rouet, J. L. Levonen, A. Dillon & R. Spiro, (Eds.), *Hypertext and Cognition*. Mahwah, NJ: Lawrence Erlbaum Associates.
Dennen, V. P. (2005). From message posting to learning dialogue: Factors affecting learner participation in asynchronous discussion. *Distance Education* 26(1), 127–148.
Foltz, P. W. (1996). Comprehension, cohesion, and strategies in hypertext and linear text. In J. Rouet, J. L. Levonen, A. Dillon & R. Spiro, (Eds.), *Hypertext and Cognition*. Mahwah, NJ: Lawrence Erlbaum Associates.
Hara, N., Bonk, C.J., & Angeli, C. (1998). *Content analysis of online discussions in an applied educational psychology*. http://72.14.235.104/search?q=cache:4xyfZIECkwwJ:crlt.indiana.edu/publications/ [viewed 1 July 2006].
Holmes, K. (2004). *Analysis of asynchronous discussion using SOLO taxonomy*. Paper presented at the Australian Association for Educational Research Annual Conference, Melbourne, Nov–Dec, 2004.
Lewis, C., & Fabos, B. (2005). Instant messaging, children and youth. *Reading Research Quarterly*, 40(4), 470–x.
Marra, R. (2006). A review of research methods for assessing content of computer-mediated. *Journal of Interactive Learning Research*. 17(3), 243–268.
Rouet, J., Levonen, J,. Dillon, A., & Spiro, R. (1996). (Eds.), *Hypertext and cognition*. Mahwah, New Jersey: Lawrence Erlbaum.
Thomas, J. (2006). *Facilitation of critical thinking and deep cognitive processing by structured discussion board activities*. http://www.celt.1su.edu/CFD/E-Proceedings/Facilitation. [viewed 30 Jun 2006].
Tzeng, Y., van den Broek, P., Kendeou, P., & Lee, C. (2005). The computational implementation of the landscape model: Modeling inferential processes and memory representations of text comprehension. *Behavior Research Methods*, 37(2), 277–287.
Wenger, M. J, & Payne, D. G. (1996). Psychology, Hypertext, Cognition & Reasoning. *Technical Communication*. Washington. 43(1), 51–53.
Winn, W. (1992). The assumptions of constructivism and instructional design. In T. M. Duffy & D. H. Jonnasen (Eds.), *Constructivism and instructional design.* (pp177–182.) Hillsdale, NJ: Lawrence Erlbaum Associates.

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Dissemination of innovations: A case study

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This paper examines three questions related to the dissemination of innovations in higher education, drawing on a review of the literature on the nature of innovations and on a case study of an innovative online project that has been widely disseminated. The first question seeks to review the question of what constitutes an innovation in teaching and learning in higher education. The second and third questions seek to understand the process of dissemination of such innovations in teaching and learning, and to shed some light on what developers of innovations might do to maximize the take up of innovations.

The project in the case study has been clearly demonstrated to have been widely disseminated beyond both the origin of the project and in new marketplaces. The project was publicised using a multi-faceted distribution mechanism involving presentations at institutions and conferences, publishing of articles, and production of templates which facilitate adoption of the project. The project also facilitated participation by others, enabling them to see first hand the potential benefits of engaging with it. The outcome of these activities has been a wider adoption or scaling up of the project than is usual. This appears to have been the result of academics' perception of the value to students of their participation in such a learning activity, the ease of adaption of the project to different contexts, and the enthusiasm of adopters for promoting high quality learning experiences.

Keywords: dissemination, innovation, higher education, role-play, simulation

Introduction

As its predecessor granting bodies have done before it, The Carrick Institute for Learning and Teaching in Higher Education is funding projects which support "innovation in learning and teaching". As was also the case for its predecessor bodies, applicants are required to put forward a strategy for facilitating the dissemination and uptake of the proposed project/s. The precise definition of what constitutes an innovation has always been problematic however, and this paper discusses a range of ways of understanding this term.

In this paper a literature review around the notion of innovation is augmented by a case study of one innovation in teaching and learning that has been sustained for more than ten years. The paper discusses the particular kind of innovation involved, the process by which it has been disseminated, and finally a description of what developers of other similar projects might learn from this project.

Thus this paper seeks to address the following questions:

1. What constitutes an innovation in teaching and learning in higher education?
2. What is the process by which such innovations in teaching and learning are disseminated or 'scaled up'?
3. What might developers of innovations in teaching and learning pay attention to in order to maximize the take up of innovations?

The paper begins with a review of the notion of innovation with particular attention to what is being developed, by whom, and for what purposes. Next, two aspects of dissemination are analysed. The first is the notion of dissemination as a distribution *activity* – "a series of conscious actions, planned by persons and organizations and intended to make something known or to be sent to other persons or organizations" (Stokking, 1996, p.269). The second aspect of dissemination is referred to as an *outcome*, and this concept will be further elaborated below.

What constitutes an innovation in teaching and learning in higher education?

Almost every book on innovation includes reference to the origin of the word ‘innovation’ as having roots from the Latin word ‘novus‘ meaning ‘new’ and “is derived into the verb ‘in+novare’ that covers the meaning ‘to make something new’”(Tidd, Bessant & Pavitt, 1997).

If “what” an innovation is, relates to something new, then the question of “why” innovate is also important. The view that innovation is critical to the growth and sustainability of business, government, education and industry is pervasive across discipline areas as diverse as Management, Education, Design and Economics. Innovation is perceived to be necessary for survival, and hence the means by which organisations are renewed, achieve growth, and remain competitive. Those who fail to engage in innovation are doomed to failure write Tidd et al. (1997, p.12) who say that “unless organizations are prepared to renew their products and processes on a continuing basis their survival chances are seriously threatened”. Others, although writing in a similar vein, note the benefits of engaging in innovation. Coyne (1999) for example, writes that “successful innovation brings us joy and confidence and well-being. It generates long-term, sustainable growth” and Janszen (2000) writes that “innovation is the golden route to building and growing a prosperous company”.

Although the authors cited above were primarily concerned with business and industry, the higher education context is not too different. The changing circumstances in which higher education operates sees government: facilitating the entry of new providers of higher education to Australia; seeking further differentiation of the higher education sector; and expressing concern at the international ranking of most Australian higher education institutions. The accountability requirements for all activities have been increased at the same time as the level of funding provided for these activities is decreased. With expectations of higher levels of research output and improved student learning outcomes, set against decreased input in terms of funding, it is clear that higher education must find new ways to go about its business, in teaching, in research and in community service. In terms of the former, the holy grail of teaching innovation has been to increase the quality of learning, the productivity of learning, while at the same time increasing access to learning. The next section discusses the range of innovations that might be developed in order to achieve these outcomes.

What innovations are being developed?

Examination of the question posed by this section of the review of ‘what constitutes an innovation’ necessitates some discussion of the variation that exists between categories of innovations that, once developed, are distributed within the community, and which then may, or may not, be adopted. As is the case for much of the content contained within this review, the literature on this issue is vast. For the purposes of this review however, only the most commonly cited distinctions are discussed, beginning with the notion of ‘innovations’ as constituting something new, as processes or products, and which result in incremental or radical change. The section also includes some discussion on the different contexts in which an innovation might be ‘new’.

Innovation as constituting something new

As noted above, a common view of the concept of innovation is that of something “new”. In business, this view is exemplified in Janszen’s (2000) definition of innovation as “the commercialization of something new, which may be:

- a new technology
- a new application in the form of a new product, service or process
- a new market or market segment
- a new organizational form or a new management approach” (p.8).

Many authors, however, acknowledge the fact that few ideas are truly “new”, rather they may be new to the context (Tornatzky & Fleischer, 1990) or may be seen as a way of regenerating practice (Dempster & Deepwell, 2002).

To whom or what is the innovation "new"?

One group of definitions focuses on the degree to which the idea or innovation is new to the individual involved. For example Potgieter (2004), refers to innovation as "an idea, practice, object or combination of these that is perceived as new by staff" (p.271). Similarly, Tornatzky & Fleischer (1990) write that "we will generally consider innovation to be a change of scope that is significant at least to the person or organisation doing the innovating".

Another group of authors refer to a range of groupings of people to whom the innovation is new. The most widely cited is the work of Olson et al. (1995) who, (citing the original work of Booz, Alen & Hamilton, 1982), define four groups to which an innovation is new:

1 new-to-the-world
2 new to the marketplace but not to the origin
3 me-too products (new to the organisation but not to the marketplace)
4 product modifications.

Herein lies one of the challenges for granting bodies such as The Carrick Institute for Learning and Teaching in Higher Education which seek to provide funding for innovations in teaching and learning – to whom should the innovation be new? On the one hand there are many who would perceive an innovation to be something new to the world or to the market place (in this case higher education) and would thus provide funding for only such projects/innovations. The success rate of these projects however, might not be as high as many would believe. Firstly, the project must come to fruition and result in implementation. This is not always the case as noted in the Alexander & McKenzie (1998) report on the outcomes of 104 innovative projects involving Information and Communications Technologies (ICT) that were funded during 1993 and 1994. Despite the grant funding being specifically for projects of one year's duration, fewer than half of the cases reported their project as being at the implementation phase (p.31) in responses to the questionnaire in 1996, and the various difficulties encountered by developers of the innovations are well documented in the report. As well as the difficulty of achieving a project outcome, a second difficulty arises during implementation of those innovations which require teachers and/or students to engage in teaching and learning activities that are very different to their previous experiences. In those situations there are numerous reports of the considerable resistance encountered from colleagues and students.

Few granting bodies allow for the possibility of funding projects/innovations which constitute "improvements or revisions to existing practices". This situation may have contributed to the current phenomenon, in which academics are more likely to develop something from scratch than to use resources developed elsewhere, simply because there is a lack of opportunity to gain the funding often needed to make the revisions required for use in a different context. Instead, the focus has been on the development of innovations which are "new".

Rather, the concept of "renovation" instead of innovation may well be a more cost-effective approach to achieving the goals of granting bodies. An approach that allows projects to be funded which seek to "improve or revise existing practices" may well result in enhancements to teaching and learning that are based on the considerable evidence about good practice that already exists in the literature, but which are often not implemented in practice.

The nature of innovations

As noted earlier, what seems to lie at the core of confusion about what constitutes an innovation in higher education, is the concept of innovation as a product or process that is, of itself "new". In this section I consider some of the dimensions of the innovations themselves, beginning with consideration of what the innovation or change is.

Product versus process innovations
Innovations might be described as either 'products' or 'processes'. Product innovations are described by Tornatzky & Fleischer (1990, p.20) as "those which are ends in themselves" and by Tidd et al. (1997) as

"the things which an organization offers". In contrast, process innovations are "those adopted as instrumental to some other end" (Tornatzky & Fleischer, 1990, p.20) and as a "change in the ways in which [products] are created and delivered" (Tidd et al., 1997).

Typical teaching and learning "product" innovations might include CD-ROMs or websites containing multimedia databases of subject resources, simulated laboratory exercises, databases of multiple choice questions, and 'trigger' videos. Typical "process" teaching and learning innovations might include online role-play simulations, the use of problem-based learning, peer-assessment and criterion-based assessment.

The extent to which a product or process must change in order for it to be considered an "innovation" is also relevant to this discussion.

Radical versus incremental innovation
This work originated with the notion of "routine" versus "radical" innovation first proposed by Nord & Tucker (1987). They distinguished routine innovation as "the process of introducing "something" that can be implemented with only minor adaptations of existing organizational routines and that fits within the existing norms and values of organisation members" from radical innovation, which is defined as "the process of introducing something that is new to the organization and that requires the development of completely new routines, usually with modifications in the normative beliefs and value systems of organization members" (p.41).

Based on this work, more recent authors (Tidd et al., 1997; Tornatzky & Fleischer, 1990) have labeled these different approaches as "incremental" versus "radical", the former indicating change of a minor nature, while the latter is intended to convey significant change which transforms practice.

The question of whether incremental or radical changes/innovations are more, or less, likely to result in widespread dissemination and better outcomes is highly contested. On the one hand, proponents of some process innovations such as continuous improvement (usually as part of a Quality Cycle) would argue that incremental changes achieved over a number of cycles of planning, doing, evaluating and improving have long lasting consequences. Westera (2004) claims that in education the "incrementalists outnumber the transformationalists by far" (p.509), since they are a group comprised largely of teachers who can continue to build on previous practices.

The critics of incremental change however, believe that it is not possible to achieve the major changes needed simply by making small changes to existing products/ processes. Seymour Papert is one such critic, arguing that "One could not move from a stagecoach to a jumbo jet by making a series of small improvements" (Papert, 1997). Similarly, Christensen (1997), in his well known book about 'disruptive' technologies, writes that many organisations are actually weakened because they are so focused on listening to customer feedback and making incremental changes to their products and processes, that they fail to see the "disruptive" or radical innovations emerging.

What constitutes dissemination?

Although often used synonymously, many authors quite rightly make a clear distinction between the terms "distribution" and "dissemination".

In defining the former for example, Stokking (1996, p.269) distinguishes three kinds of *distribution*, all of which involve the dissemination of information. This 'distribution' can be:

- an *activity* – "a series of conscious actions, planned by persons and organizations and intended to make something known or to be sent to other persons or organizations"
- a *process* – "the fact that, either as a result of consciously planned actions or unplanned actions, ideas and materials are transferred between persons" resulting in the ideas and materials becoming known to more people
- a *result* – a snapshot, "the degree to which the ideas and materials are known to and possessed by individuals at a given moment in time".

With these distinctions in mind, the range of *distribution activities* discussed in the literature include production of websites, papers at conferences and other symposia, submission to Clearinghouses and other similar databases.

Another way of understanding dissemination beyond the usual quantitative descriptions of use, is contained within Coburn's (2003) four levels of "scaling up" an innovation. These levels relate to:

1. *depth* – the innovation has resulted in change in the classroom that "goes beyond surface structures or procedures such as changes in materials…to alter teacher's beliefs … and pedagogical principles" (p.4)
2. *sustainability* – the change, as described above is sustained over time in the original and subsequent contexts
3. *spread* – the innovation spreads to a greater number of contexts, and
4. *shift in reform ownership* – "ownership" of the innovation shifts from the original innovator to the adopter.

This framework presents a useful way of viewing the fate of innovations some time after their original implementation, an area which has so far been neglected in the literature.

Case study: A role-play simulation for teaching Middle-East politics

The project chosen for this case study is an online role-play simulation, developed with initial funding of $33,165 from the Committee for the Advancement of University teaching (CAUT) in 1994. In terms of the discussion of innovations from the literature described above, the role-play simulation is an example of a 'process' innovation and one which is radical in nature (rather than incremental). Unlike many projects funded ten years ago, the project is still in use, having moved with Dr Vincent when he transferred to Macquarie University. It has also been widely taken up by others in a range of contexts.

Background to the simulation

This project had its origins at the University of Melbourne in the late 1980s where it was the brainchild of Dr Andrew Vincent (now at Macquarie University) and Dr John Shepherd (now at the University of New South Wales). Dr Vincent was concerned that, in order to learn about the complexities of politics in the Middle East, his students needed an opportunity to engage in more authentic learning activities than those afforded by the reading of books. Whilst on study leave in the United States, he encountered the use of role-play and introduced it in his classes at The University of Melbourne using the technologies of paper, pencils and "runners" to carry messages between classrooms.

The Political Scientist Dr Vincent met the Computer Scientist Dr John Shepherd by chance, and the latter became a partner in the project, contributing his particular expertise in information and communication technologies to facilitate electronic communication between the teams of students who were playing various roles in the simulation. The CAUT grant enabled them to develop more sophisticated software to manage the role-play simulations.

Aims

The purpose of the role-play simulation was for students to gain:

- an understanding of negotiation and decision making skills
- an appreciation of the inherent complexities of social systems
- computer/ network skills
- an enhanced understanding of Middle-East politics (Alexander & McKenzie, 1998).

Design and activities

Some ten years on from the original simulation, the project still operates in very much the same way as it was in 1994, although with the addition of some new ICTs. The original project design is considered to have been successful.

Students still work in small groups of 3 or 4, with each group being allocated the role of a person or organisation that is prominent in the Middle-East. Over a period of approximately 2–3 weeks, each group develops a detailed profile of the role they are playing, which they then post on the web for other students to view. Once the profiles have been completed, Dr Vincent releases a scenario of an event that is likely to happen in the Middle-East.

Over the next 3 weeks, students participate in the simulation asynchronously, working to advance the interests of the role they are playing. A small group of “controllers” monitor the simulation, ensuring its fidelity. Finally, a live teleconference is held where students discuss issues that have emerged during the simulation. More often than not, the simulations have involved students from other countries, and this live teleconference provides an important opportunity for them to “meet”, and debrief the entire activity.

In the next section, both the distribution and the dissemination of this project are discussed using Coburn’s (2003) work on scaling up an innovation as a framework for analysis.

Dissemination of the simulation

Spread
The first criterion for analysing the degree to which an innovation has been “scaled up” is that of its spread. In this case study there is evidence of the project having been disseminated:

- within the same department as the original project
- within the same university in different disciplines
- within different universities in the same and different disciplines, and
- within the different contexts of school education and the armed forces.

The project was taken up by others working in Dr Vincent’s original department at the University of Melbourne. The initial “distribution” mechanism that enabled this to happen was the opportunity for participation in the original project. Mr Roni Linser was one of the original controllers for Dr Vincent’s early simulations when email was the only technology used to support communication. When Dr Vincent left the University, Mr Linser continued the simulations because he thought they were the best teaching method for Middle East Politics he had ever encountered. He continued to run the simulations every year from 1994 to 2002, and was instrumental in persuading a number of his colleagues, both within his department and outside it, to use simulations in their teaching. The role-play simulations have now been used in a variety of political science courses “including Middle-East politics, World Politics, Theories of Power, Russian Politics, Australian Foreign Policy, and International Politics of the Asia-Pacific” (Linser & Ip, 2002).

When his contract expired at the end of 2002, Mr Linser left the University of Melbourne and, in partnership with Albert Ip, formed the company Fablusi Pty Ltd, whose major product is a Role-Play Simulation Generator. Since his departure all the simulations in Political Science appear to have ceased and the University no longer offers the Middle East Politics options. However, it is noteworthy that the innovation continued for almost ten years despite the original developer having left the department.

The simulation has also been adapted and embedded within the same discipline area in different universities. Several Political Science Departments now make use of role-play simulations in their teaching, and most academics cite Dr Vincent’s work in their papers describing their work. For example, at the University of Western Australia, Dr Samina Yasmeen, as part of a Committee for University Teaching and Staff Development (CUTSD) grant conducted a simulation “based on an international scenario which required resolution by members of the UN Security Council” (Kinder, Fardon & Yasmeen, 1999). The initial simulation (1998) differed from the Vincent approach in that each student (rather than a group of students) was assigned a role, and the simulation was conducted entirely face-to-face within each of the tutorial groups. After an evaluation of the initial simulation, the second version made use of Internet-based software, such as a bulletin board and chat rooms, for all communications between participants. It is also noteworthy that this project was funded by CUTSD as an innovation. In this case the innovation was not new to the market-place or the discipline, rather it was new to the individual and the department.

In 1997, Dr Vincent was invited to present his work on role-play simulations to a forum at the University of Technology, Sydney (UTS), where several of the academics present became interested in the approach and subsequently adapted it to their own teaching.

A group of academics in the Faculty of Engineering at UTS, who were teaching the subject *Technology Assessment*, were concerned that their students only ever had the opportunity to learn the socio-technical aspects of engineering and, having heard about Dr Vincent's simulations, thought this would be an ideal way for the students to engage with the political dimensions. Thus, in 1999 the Engineering students from UTS joined the Political Science students from Macquarie University and from the University of Maryland in the United States, in a simulation which was tailored to include roles for technical specialists around the area of water management.

Also present at this seminar, Associate Professor Mark Freeman from the Faculty of Business perceived the advantages of the role-play simulation to be that they are "engaging for students, complex and requiring them to reconcile ambiguity". He thought they would "give students a motive for stepping in the shoes of someone who thought differently" and that was of enormous appeal to him.

In 1998 he and his colleague (Professor Michael Adams), adapted the simulation for use in teaching the Finance subject *Securities Market Regulation* with research assistant John Capper supporting its evaluation. This subject involved students in understanding the regulation of securities markets where there are two conflicting paradigms – Finance and Law. The former has efficiency solutions as the primary concern, whilst equity is the concern of the latter (Freeman & Capper, 1999).

The organisation of the simulation differed in three ways from the Vincent approach:

- individuals (rather than groups of students) were allocated a role
- the simulation was conducted anonymously such that the students were unaware of which of them was playing which role (although this was revealed after the very end of the simulation in the debrief activity), and
- the simulation was conducted entirely online (rather than the combination of online and face-to-face) although the debrief was conducted face-to-face.

Professor Freeman noted a number of challenges in adopting the role-play simulation approach. They included: persuading his co-teacher on the subject to participate; finding ways of making his own subject interesting and appealing; lack of specific guidelines to follow in terms of what "steps" to take in setting up the simulation; and coming up with scenarios that would be inclusive of all participants playing individual roles (and to do this every year). Last but not least, he had to persuade his students that this very different way of learning, which takes a lot of work on their part, would be to their benefit.

Professor Freeman received considerable recognition for his work:

- the simulation was recognised by the Australasian Society for Computers in Learning in Tertiary Education (ascilite) in 1998 with the "Best web-based teaching project" award
- his 1999 paper describing the simulation was published in the Australian Journal of Educational Technology, and
- he was promoted to Associate Professor (and believes that the success of the simulation contributed to this).

Finally, the project has been adopted in a context other than higher education through the use of simulations in secondary schools. In New South Wales, a number of schools have participated in the role-play simulations as a direct result of a series of teachers' conversations with Dr Vincent about the success of his work in this area.

The first school-based simulation was conducted in 2001 with students taking the Arab-Israeli conflict option for year 12 Modern History in two Sydney public high schools. In 2002, the simulation was run for year 11 students only, and in 2003, they were joined by a third school.

One of the first teachers to see the potential of the simulations was Ms Dulcie Miltiades, who “wanted to give kids a greater understanding of what is happening in the Middle-East”. Although teachers can be enthusiastic in their teaching, and can make use of excellent text-books on the subject matter area, she believes that the simulations provide an opportunity for the students to play out roles and actually “take on what is happening”.

The simulation itself took place over three weekends and two school weeks. This is less than the original three week time period allocated, but the reduction in time was thought necessary because of the “consuming nature” of the simulation. In common with reports of the operation of the simulation in higher education, Ms Miltiades reported that students were participating in the simulation “all the time – during their lunchtimes, evenings, and even at 2a.m. there have been kids logged on”.

At the conclusion of the simulation period, students meet face-to-face at a “Peace Conference”, which is used to de-brief the experience, and students typically dress in the role of the character they have been playing.

Once again, the success of the simulations seems to have been directly attributable to the enthusiasm of a small number of dedicated individuals, without whom the simulations would almost certainly not have commenced, nor been adapted for secondary school use. It is clear that Ms Miltiades has been instrumental in the success of the simulations within schools, and has spent many hours of her own time in these activities, with little or no external recognition for her efforts. She also acknowledges the Macquarie ICT Innovations Centre, without whose support she doubts the simulations would have continued.

Depth

There is clear evidence that the simulations have resulted in a significant change to teaching approaches that go beyond the simple development of “teaching materials” to support a deeper approach to student learning. The higher quality student learning outcomes resulting from use of role-play simulations have been widely reported (Vincent & Shepherd,1998; Freeman & Capper, 1999; McLaughlan & Kirkpatrick, 2001) but space precludes their further discussion here.

Sustainability

There are many levels at which this case study could be analysed in terms of sustainability. On the one hand, the innovation has continued in at least two different universities for a significant period of time (10 years in one, and 8 years in another). However, that sustainability appears to be related to the presence of particular individuals, be they the originator or the enthusiastic adopters of the project. When that person leaves the department or university, the simulation invariably ceases in that context, but from early evidence, appears to be carried into the next context.

Shift in reform ownership

One of the apparent strengths of this process innovation is the high degree of “ownership” afforded to adopters, each of whom has made the simulation their own, through both minor and major modifications to the process and products used to conduct them in different contexts.

This shift in ownership has been facilitated through a further project, funded specifically for this purpose. In 2000 the Australian Universities Teaching Committee (AUTC) commissioned a project entitled “Information and Communication Technologies and their role in Flexible Learning” which aimed to assist academics to create high quality, flexible learning experiences for students by:

1 identifying high quality learning designs used in higher education
2 selecting those suitable for redevelopment in the form of reusable software, templates and/ or generic guidelines, and
3 developing those reusable resources and making them accessible from a central web site.

After an extensive review, role-play simulation was selected as one of the high quality learning designs to be showcased. The project website includes a description of role-play simulations, and a number of case studies (including the Middle-East Simulation), with guidelines and advice on how academics might go about designing and implementing them. Provision of these guidelines greatly simplifies the operation of online role-play simulations, facilitating the shift-in-ownership needed for scale-up of this innovation.

Distributing and disseminating innovations

In analysing the dissemination of the original project, a number of 'distribution' mechanisms were evident and were clearly critical to the eventual dissemination of the project. They were:

- the opportunity for potential adopters to take on a legitimate role within an early phase of the innovation, enabling them to see the value of the project to enhancing the quality of learning
- publication of a paper in a journal by the original innovator describing the innovation;
- presentation of a seminar on the innovation at another university
- the winning of awards for teaching and learning and resulting high profile of adopters of the innovation
- presentation of subsequent projects at conferences
- publication of papers in journals and conferences by adopters describing the adoption and adaptation of the innovation
- opportunities for conversations with potential adopters.

These distribution mechanisms were necessary but not sufficient to guarantee the eventual dissemination or 'scaling up' of the project. There was evidence that, having encountered the idea of the role-play simulation, the take-up or dissemination was influenced by:

- the perception of academics/teachers that role-play simulations would increase the quality of student learning outcomes
- existence of a champion/s of the innovation (other than the original developer) who was/were instrumental in persuading others of its value
- commercialisation of the innovation process, providing a set of tools that make it possible for others to adopt the innovation
- enthusiasm of participating teachers
- ease of adaption of the simulation to teachers' own context and values.

Conclusions

The case study highlighted above is an excellent example of an innovation in teaching and learning that is radical in its nature and which constitutes a teaching process (rather than product). The project has been widely disseminated beyond both the origin of the project and to new marketplaces. Critical to the success of this dissemination was the existence of a multi-faceted distribution mechanism involving more traditional presentations at institutions and conferences, publishing of articles, and production of templates which make the project easier to adopt. The project also facilitated participation by others, enabling them to see first hand the potential benefits of engaging with the project.

The outcome of the distribution of the project was been a wide adoption or scaling up of the project than is usual. This appears to have been the result of academics' perception of the value to students of the participation in such a learning activity, the ease of adaption of the project to different contexts, and the enthusiasm of adopters for promoting high quality learning experiences.

There are clearly opportunities for others to adopt this innovation, yet the radical nature of this project requires both time and money for an adopter to do so. While the role-play simulation is new to the individual adopter, it may not be considered by a funding body to be sufficiently 'new' to warrant funding for this purpose. There is merit in funding bodies considering targeted funding to enable further adoption and adaption of such projects by reconsidering the question of to whom an innovation must be new.

References

Alexander, S., & McKenzie, J. (1998). *An Evaluation of Information Technology Projects for University Learning*. Canberra: Department of Employment, Education, Training and Youth Affairs.

Christensen, C. M. (1997). *The innovator's dilemma: when new technologies cause great firms to fail*. Boston, MA: Harvard Business School Press.

Coburn, C. (2003). Rethinking Scale: Moving Beyond Numbers to Deep and Lasting Change. *Educational Researcher*, *32*(6), 3–12.

Coyne (1999), forward to: Van de Ven, A. H., Polley, D. E., Garud, R., & Venkataraman, S. (1999). *The Innovation Journey*. New York: Oxford University Press.

Dempster, J., & Deepwell, F. (2002). *A review of successful project approaches to embedding educational technology innovation into institutional teaching and learning practices in higher education*. (Study funded by the LTSN Generic Centre): Centre for Academic Practice, University of Warwick.

Freeman, M., & Capper, J. (1999). Exploiting the web for education: An anonymous asynchronous role simulation. *Australian Journal of Educational Technology, 15*(1), 95–116.

Janszen, F. (2000). *The Age of Innovation: making business creativity a competence, not a coincidence.* London: Prentice Hall.

Kinder, J., Fardon, M., & Yasmeen, S. (1999*). Offline or online? A simulation exercise in a first year international politics unit*. Paper presented at the 16th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education, Queensland University of Technology, Brisbane.

Linser, R., & Ip, A. (2002). *Beyond the Current e-Learning Paradigm: applications of Role-Play Simulation (RPS) – case studies*. Paper presented at the e-Learn 2002 AACE Conference, Montreal, Canada.

McLaughlan, R., & Kirkpatrick, D. (2001). Peer Learning Using Computer Supported Role Play Simulations. In David Boud, Ruth Cohen Jane Sampson (Eds.), *Peer learning in higher education: Learning from and with each other* (pp.141–155). London: Kogan Page/Sterling, VA: Stylus Publishing.

Nord, W. R., & Tucker, S. (1987). *Implementing routine and radical innovations*. Lexington, MA: Lexington Books.

Olson, E. M., Walker, C., & Ruekert, R.W. (1995). Organizing for Effective New Product Development: The Moderating Role of Product Innovativeness. *Journal of Marketing*, *59*(1), 48–62.

Papert, S. (1997). *Looking at Technology Through School-Colored Spectacles*, from http://www.papert.org/articles/LookingatTechnologyThroughSchool.html

Potgieter, B. (2004). *Exploring leadership and organisation for change and innovation in higher education.* Paper presented at the Proceedings of the 2004 Annual International Conference of the Higher Education Research and Development Society of Australasia (HERDSA), Miri, Sarawak.

Stokking, K. M. (1996). Dissemination and Utilization of Knowledge and Innovations. In T. P. D. P. Ely (Ed.), *The International Encyclopedia of Educational Technology, Second Edition* (pp. 269–273). Oxford: Pergamon.

Tidd, J., Bessant, J. R., & Pavitt, K. (1997). *Managing innovation : integrating technological, market, and organizational change*. New York: Wiley.

Tornatzky, L. G., & Fleischer, M. (1990). *The Processes of Technological Innovation*. Lexington, MA: Lexington Books.

Vincent, A., & Shepherd, J. (1998). Experiences in Teaching Middle East Politics via Internet-based Role-Play Simulations. *Journal of Interactive Media in Education, 98*(11). http://jime.open.ac.uk/98/11.

Westera, W. (2004). On strategies of educational innovation: Between substitution and transformation. *Higher Education*, *47*, 501–517.

Websites

Learning Designs Project. Available at: http://www.learningdesigns.uow.edu.au. Accessed 31 July, 2006.

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A blended approach to collaborative learning: Can it make large group teaching more student-centred?

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Current educational thinking promotes a student-centred approach to teaching as more engaging and challenging for students, leading to improved learning outcomes. But what is 'student-centred' learning, and how can it be achieved in a higher education setting with very large classes and content-rich courses? In a materials engineering course for 300 first-year engineers, an online group project was introduced to add authenticity and collaborative activity into the course, and to improve student engagement. We explore the design, development and implementation of the project, and see if the intended outcomes were achieved.

Keywords: student-centred, collaborative learning, problem-based learning, group work, large group teaching, online

Introduction

The course (Materials Engineering) is one with a large (300+) first-year cohort, and content-rich subject matter (materials science for engineers). In addition to lectures and laboratory sessions, the course was already successfully using computer-based tutorials (Box et al.., 2001), and when the Educational Development and Technology Centre (EDTeC) at UNSW was requested by the School of Materials Science and Engineering to review these with the intention of providing them online via WebCT, it was seen as an ideal opportunity to use the online learning design to improve student engagement, and to incorporate learning for graduate attributes such as problem-solving and team-work.

The aims for the course development were to:

- enhance student engagement and motivation
- improve the ability of students to apply their learning to real-life problems
- encourage students to be more self-directed in their learning
- support the development of generic skills
- make student access to the course more flexible
- improve efficiency for teachers managing the course

It was decided that, for this course, a student-centred approach could enhance the engagement and motivation of students, provide a more authentic learning experience, and develop generic skills. An online, problem-based group project was planned that could incorporate these elements while utilising the upgraded computer-based material as project resources.

The online course was designed by a project team comprising the academics involved in implementing the course and an educational designer who advised on the design of the online components and built the online course. There was substantial production support, including a multimedia designer for 'Flash' elements in the online tutorials.

Student-centred learning

Knowles (1975) proposed a teaching approach that placed students at the centre of their learning. Biggs (1999) focused on "what the student does" (p. 8) as being critical to what is learned, and suggests that the focus of teaching should then be on "whether student activities leading to appropriate learning are being supported" (p. 8). In content-rich courses there is a tendency to use a topic-based knowledge-transmission approach which, while it may effectively allow students to pass exams, does not support them in contextualising and synthesising their knowledge, and applying it in real world contexts. This teacher-centric approach inhibits the students from grounding knowledge in their own experience, and from being able to transfer learning to different contexts and to solve open-ended problems, all of which are necessary skills for future learning and employment.

Hogan (1999) voiced the realisation that she, as the teacher, "was the most active learner in [her] class – because [she] had total responsibility for what was learned and how it was presented" (p. 79). As Biggs (1999) points out, "It's not what *teachers* do, it's what *students* do that is the important thing" (p. 8). If, with teacher guidance and support, students can take responsibility for what they learn and how they learn it, the learning process becomes more challenging, engaging and responsive. A key challenge for student-centred learning design is how to encourage and support students to take on this responsibility, with the teacher becoming a facilitator of learning rather than the provider of knowledge.

Based on Gibbs (1999), Sparrow et al. (2000, online) suggest that student-centred learning displays three core characteristics: the student has input into "what is learned, how it is learned and when it is learned". They propose that this definition implies a need for students to assume a high level of responsibility in managing their learning.

Problem-based and collaborative learning

A strongly supported method for promoting student-centred learning is problem-based learning, a constructivist approach that requires learners to construct and develop their own knowledge through researching and developing solutions to an open-ended, 'real-life' problem (Clouston, 2005).

Problems given for assessment are often well-defined with a specific correct answer, which is comfortable for students, and easy to assess for teachers. But this does not prepare students for real-life problems that they will face in their working life, which tend to be ill-defined, and with a range of possible solutions (Herrington, Sparrow & Herrington, 2000). Solving a problem that is more authentic requires an approach that is both constructive and critical.

Collaborative learning, where students work together and knowledge is socially constructed, is a complementary approach that supports the transfer of responsibility to students, while also developing important workplace skills such as discipline-based communication and the ability to work in a team. Livingstone and Lynch (2000) suggest that:

> Given the demand among employers for graduates who can operate successfully in teams, it is important to engender a positive response from students for team working. … Well-structured and managed group work provides students with a set of transferable skills and a vehicle for critically examining their subject, both of which are important components of modern courses (p. 340).

A collaborative approach, through group work, would not only provide the students with an authentic learning experience that would develop generic skills in communication, collaboration and team building (Oakley, Felder, Brent & Elhajj, 2004; McAlpine, 2000; Livingstone & Lynch, 2000), but would also assist teachers in the management and assessment of the large cohort.

A blended approach

A blended approach to teaching and learning has the potential to utilise the best aspects of face-to-face and online modes, to enhance the learning experience. Course content, with related activities, can be provided online, allowing face-to-face time to be utilised for activities that are more hands-on, such as labs and demonstrations. Therefore, some non-interactive face-to-face activities, such as lectures, can be replaced or supplemented by more interactive online activities. An online component can also support social aspects of the course, promoting a 'community of practice' during the group project, and enhancing teacher contact with, and responsiveness to, the students.

Design of the group project

The project design is focussed not upon the course content but upon the activity that students complete (Herrington et al., 2000). The project was designed to require critical thinking and application of understanding derived from research, with the presentation of a 'real life' problem providing the students with an authentic learning experience, and the other components of the course serving as resources for the project.

While this course still has elements requiring face-to-face contact (lectures, laboratories), a particular challenge with the large cohort is to manage facilitation of the group learning, without requiring substantially more teacher input. Hannafin and Land (1997) acknowledge the logistical problems in managing a student-centred approach, and suggest that "…technology-enhanced, student-centered learning environments … use technology to enable flexible methods through which processes can be supported" (p. 168).

The tutorials were already computer-based, and planned for online delivery, so using the online environment to manage the group learning for a large cohort was practical for teachers, and had student benefits in providing flexibility and encouraging self-directed learning. Some lecture hours were replaced with online facilitation time, and some of the group facilitation responsibility was shifted to the students by requiring the project groups to be self-facilitating, and to participate in a peer review of another group's submission.

Authentic problem

Student groups could select a topic from a list of everyday items (e.g., bicycle frame or a golf club), for which they would investigate the characteristics of materials, select those materials most appropriate for the task, and suggest a manufacturing route, with justification based on research. The research and documentation process was left up to the group to organise, although a template for submissions was provided to assist in organising the information. To provide formative feedback, and to check on group functionality, groups were required to make several submissions during the process, some of which were summatively assessed, including a peer review.

Peer review

Intrinsic to the experiential learning cycle propagated by Kolb (1984), among others, is the opportunity to reflect upon learning. Peer review offers the opportunity for students to not only become aware of how other learners approach a similar problem, but also develop an understanding of the criteria by which they may evaluate their own work, thereby promoting constructive reflection. For this project, one of the submissions was peer reviewed, with each group peer reviewing a project with a different topic than their own. The group members were then graded on their performance as reviewers. Distribution of marks frequently emerges as an issue in group work. So that student grades could be influenced by their group participation, a group peer review process, whereby the performance of the individual members of groups was assessed and graded by other team members, was also included.

Resources and support

Other aspects of the course retained a more traditional approach. Hannafin and Land (1997), suggest that "many learners cannot effectively engage higher-order tasks until they acquire sufficient background knowledge or skill. In such instances, conventional directed learning approaches support the automization of important foundation knowledge and skills"(p. 191). It was expected that the lectures, labs and online tutorials, where a more directed approach was taken (including self-tests and quizzes), would provide pre-requisite knowledge, and constitute a major resource for students researching the project. Links to relevant web sites provided a starting point for independent research.

Other online support was provided, including a moderated discussion forum (Help forum), detailed project guidelines and resources to support the group facilitation process. Students were encouraged to address course-related queries to the online Help forum, rather than contact the teacher directly. This successfully allowed all students to see the feedback, and often to answer each other's queries.

The requirement to submit several submissions for the project, as well as a peer review for the work of another group, provided multiple formative feedback opportunities.

Group facilitation and orientation

The groups were randomly generated to provide the best mix of ability, diversity of experience, and ethnicity, as well as to simulate the real world situation (Oakley et al., 2004). The groups were generated to consist of four students since this size was considered large enough to accommodate future 'drop-outs' while being small enough to promote inclusivity. The students were first-year engineering students who mostly had little experience of either group work or online learning. To support the group facilitation, they were provided with some online information about how to work in groups, and a template for a group contract to assist with establishing group roles. Salmon's 'five-step' model for enabling online learning (Salmon, 2001) recommends the inclusion of an initial socialisation phase, so orientation activities were included to introduce students, firstly to the online environment, then to the communication tools and to their group members.

Implementation

The course comprises one eighth of the session workload for the students. It is at introductory level but, for most students, it is the only learning provided in materials science during their program and it is therefore also comprehensive. The assessment for the course is 10% from laboratory reports, 10% from online tutorials, 20% from the group project, 20% from a midsession quiz, and 40% from the end of session exam.

There have been three implementations of the online project, which runs for one semester (14 weeks). The first, in 2004, used WebCT CE 4 as the online learning management system (LMS), while in 2005 and 2006 WebCT Vista 3 was used. It should be mentioned that the 2005 implementation was a pilot project in UNSW's use of Vista, and some technical issues caused problems for students.

The intention of the group project was that the groups be self-facilitating, and to assist in the management they were asked to appoint a spokesperson who would communicate with the instructor and submit work on behalf of the group. Each group was provided with a private discussion board to allow them to communicate online. The group was also required to negotiate a group contract, and to post it on their group discussion board by the end of Week 3.

As part of the preliminary activities, the students were provided online with background material on the benefits of, and the processes involved in, working in groups. A number of different topics were posted in Week 4 and the groups requested to select one. The topics were then assigned to the groups on a first-in basis. Approximately seven groups were assigned each of the different topics. A public topic discussion board was then provided for each of the topics. The discussion board was monitored on a daily basis.

The group project involved five separate submissions, three of which were assessable. The first submission (assessable) was a preliminary material selection (generic material selection) which involved identifying the required material properties for the components in the item and identifying which generic classes of material would satisfy these. This submission was due in Week 7. The second submission, the peer review (again assessable), was due in Week 9 (the midsession quiz was held in Week 8). The third submission, due in Week 11, was non assessable but was incorporated to ensure that students were progressing their work. This required the group to revise their first submission and to select specific (as against generic) materials for the components in their item. A fourth (non assessable) submission was due in Week 12 in which the groups had to outline the manufacturing route for their item. The final submission (assessable) collated the work done in Submissions 3 and 4 and additionally required identification of suppliers. This was due in Week 13.

In the design of the project it was recognized that it was necessary to ensure a comparable level of difficulty across the range of projects provided. This was a challenge since some items could be more complex than others. It was therefore suggested that the groups should usually examine 2–3 components from their item, although in some cases (the more complex ones) only one component might be appropriate – a flexibility in keeping with the goal of making the problem ill-defined. Detailed instructions of the tasks required were provided online, together with a template for submissions, and the criteria for grading the project.

The groups were each given instructor feedback on their first and third submissions, as well as the peer review of their work for the first submission, which had been undertaken by one of the other groups. This feedback was intended to assist the groups in revising their earlier submissions for incorporation into the final submission. All final submissions were posted online in Week 14 for all students to view. The first submission and the peer review were each assigned 25% of the total project mark with the final submission making up the remaining 50%.

To accommodate the possibility that some students might contribute less than others, a peer assessment was incorporated where students rated the performance of the others in their group. They were required to assign a mark of minus 3 to plus 3 to each of the members, with the requirement that the total marks assigned summed to zero. Based on the peer assessment, the marks for the individual members were then moderated by up to plus or minus 10%. The peer assessment was required to be submitted in Week 13 at the completion of the project.

Evaluation

Were the aims achieved? Implementation 1 (2004)

Substantial evaluation was done for each implementation of the course, assessing the design of the online component of the course in the context of the whole course. It particularly referenced the project aims detailed earlier and identified in the subheadings below. The evaluation design was both objectives-based and participant-oriented. The instruments used included student grades and survey data, student focus groups, and teacher interviews. The results for 2004 were generally positive, Figure 1, although some problems were identified.

Student engagement and motivation
Response to a survey question on engagement in the group project was equivocal, with only 50% of students agreeing to the statement "The group learning activities made me more involved" (see Figure 1). Management issues associated with group work dominated student feedback about the project. One student commented: "the group activity sucked because it was all online. If we chose our groups we would not have problems with communication". A student suggestion for improving the course was: "Better group assignment allocations. Getting stuck with dropkicks is not fun". Project workload also emerged as an issue, and likely contributed to the unsatisfactory participation rates.

It is recognised that collaboration is not an automatic result of team work (Oakley et al., 2004), and that "initial instructor awkwardness and student hostility are both common and natural" (Felder and Brent, 1996), while Sparrow et al. (2000) note that the introduction of student-centred methods to a cohort that is largely accustomed to teacher-centric approaches often results in negative evaluation responses. These attitudes were evident in focus groups and surveys, with the major issues being group management, non-participation of group members, and the perceived value of group work. Oakley et al. (2004) suggest that "being part of an ineffective or dysfunctional team may well be inferior to independent study in promoting learning and can lead to extreme frustration and resentment" (p. 9); they propose that students need support to learn the skills required for high-performance teamwork. Because the size of the cohort required groups to be self-facilitating, additional support material on group facilitation was clearly needed, with a focus on how groups could collaborate more effectively on the problem.

Apply learning to real-life problems
There was some evidence of engagement engendered by an authentic problem. Comments on ‘The best features of this course’ were: “Learning about how material properties relate to real-world problems and situations”; “Enjoyed applying what we’ve learnt”, “Apply things learnt from the lectures and tutes to actual objects”. Survey data indicated that most students (83%) felt that what they learned in the course had helped them to solve the given problem (Q3, Figure 1).

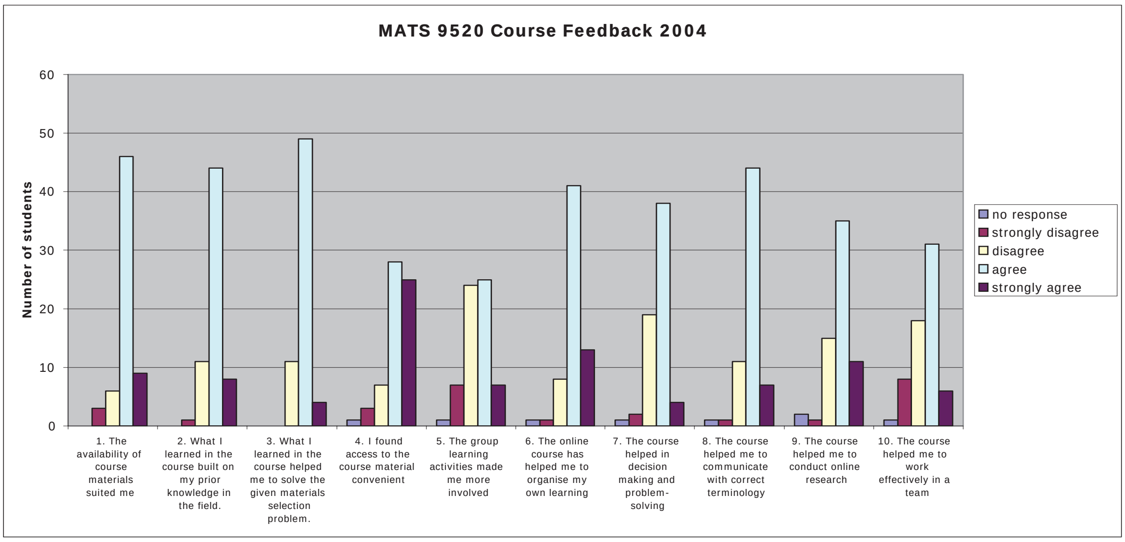

Figure 1: Course feedback survey 2004

Self-directed learning
Most students (84%) agreed that the online course had helped them to organise their own learning (Q6, Figure 1). They were also extremely positive about the flexible access to online aspects of the course, which seemed to engender a feeling of control and encourage self-responsibility. Comments on ‘The best features of this course’ included: “the freedom of online tutorials and the web based communication and approach to material”. In focus groups, students were critical of some others who were not able to organise themselves effectively in doing the group work.

Development of generic skills
There was substantially positive response to survey questions relating to development of generic skills, particularly communicating with correct terminology (80% agreed, Q8), and conducting online research (72%, Q9). Slightly lower, but still positive, results for decision-making and problem solving (66%, Q7), and working effectively in a team (58%) were obtained (Q10, Figure 1).

Student access to the course more flexible
The flexibility of access to tutorials and group discussions was very much appreciated, reflected in both surveys and focus groups. Comments on ‘The best features of this course’ included: “the course can be done online, that means we can study 7/24, I think it is good”; “The fact that they made it flexible, you didn’t have to meet face-to face, everything available on line”. 86% of students agreed that ‘The availability of course materials suited me’, while 83% agreed that they ‘found access to the course material convenient’ (Q1, Q4, Figure 1).

Efficiency for teachers managing the course
The flexibility suited teachers too, with much facilitation being able to be done by teaching assistants. The need to provide teaching assistants with facilitation guidance became evident, with some criticism expressed in student focus groups of the efficacy of online feedback in one implementation (2006). While lecture time was reduced, and time spent marking tutorial quizzes was eliminated by using computer-

based grading, facilitation of the group project, and assessment of the project submissions, was time-consuming and did not lead to a net benefit in time-saving. Reduction in lecture time, and some use of teaching assistants mitigated this. A focus for ongoing implementation, however, must be to further improve efficiency. Improvements in group facilitation processes and in project structure and assessment criteria will support this aim.

Student grades
The introduction of the group project had no significant effect on the overall grades; indeed the relative grades over the years have remained remarkably consistent, with only a 0.1% variation. The group project was only weighted at 20% of the course, so it is perhaps not surprising that the grades did not improve. When student-centred methods are introduced, the continuation of traditional assessment methods (eg examinations) may not reflect the range of learning achieved (e.g., ability to apply knowledge in new contexts, development of generic skills and knowledge). The group work effect of constraint on performance of high-achieving students, and improvement of performance for low-achievers, was evident, with fewer students in either the distinction or the failure grade range.

Collaboration vs. cooperation
As the groups were self-facilitated, it was required that each group negotiate roles and develop their own plan for doing the project work. Ideally, each group member would have input into each project aspect, but it was possible for there to be a 'vertical' division of tasks, with each member producing one part of a submission – more of a co-operative approach than true collaboration (Dillenbourg, 1999). A student commented: "[The project was] easy to separate into different sections, you didn't have to meet, you could do it separately".

Plagiarism
During the first running of the project it was realised that some students were not fully aware of the issue of plagiarism, with substantial chunks of submissions clearly pasted in from web pages. This also caused problems for groups, with students realising that plagiarism by one of their members could jeopardise them all.

Formative evaluation and feedback
While there were numerous opportunities for formative evaluation in the course of the project, many comments related to the desire for more examples and formative evaluation activities in the online tutorials. In some cases it was felt that more self-tests in similar format to the quizzes would be beneficial, while, in others, practice exam questions were specifically requested. This highlights the issue of whether the formative evaluations would truly enhance learning, or simply coach for exams, as the exam mark still comprises the largest assessment component.

Student workload
The work involved for students in preparing the project submissions was perceived to be onerous, although unequal sharing of the group load contributed to this perception. Student withdrawals affected the group size, and that affected the workload for the remaining students, as well as making facilitation difficult. The problem definition proved to be problematic for some students, with some groups with simple items choosing to look at only one component, while others with quite complex items looked at two or three components. Some students suggested that the weighting given to the group project should be greater. This should encourage better group participation, and promote deeper involvement in the collaborative activity.

Improvements and subsequent implementation (2006)

Student engagement and motivation
In the first implementation a substantial minority of students were very negative about the group work experience, and felt that it was not useful or engaging. For subsequent implementations, the purpose of group work, and of the peer review activity, was clearly articulated at the start of the course. Feedback indicated that there was now more appreciation of the benefits of group work, even when it was challenging. Adjusting the workload for the project (see below) also addressed the issue of motivation to some extent, and subsequent evaluations showed that students were generally more satisfied with the group project. In 2006, 64% of students in agreed to the statement "The group learning activities made me more involved" (Q5, Figure 2).

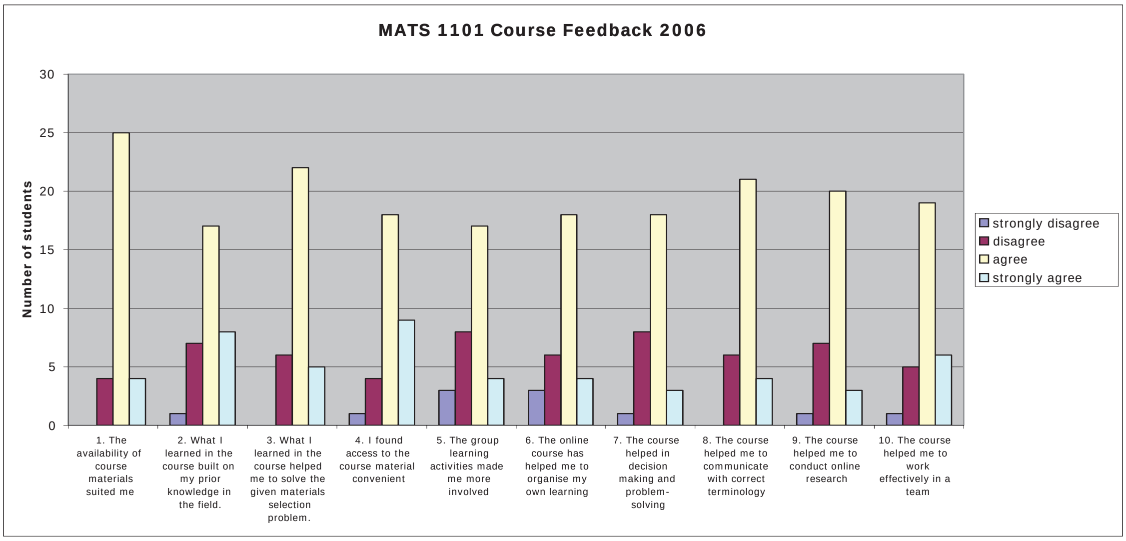

Figure 2: Course feedback survey 2006

There were ongoing problems reported by a small number of groups relating to non-participants. A check on early non-participation in discussion, with absent group members being told by the teacher that they would be unenrolled if they did not respond, was effective in arousing some stragglers. Some groups, however, seem to need more support for group facilitation processes, and more explicit group facilitation guidelines have now been provided. The relatively small weighting given to the project continued to be an issue, and the weighting has now been increased (see *Formative evaluation and feedback* below).

In 2005 and 2006 the group composition was based on laboratory groups, rather than randomly selected, to assist students in identifying non-participants. This improved the group formation process, but students still requested a face-to-face group orientation session, which has now been introduced, to improve the ability of groups to organise themselves.

Self-directed learning
Students agreeing that the course had helped them in this area fell from 84% in 2004 to 67% in 2006 (Q6, Figure 2). This could be due to the reduced project workload and increase in support reducing the learning challenges for students. This raises the question of whether workload adjustments or additional scaffolding to support less able students, reduces the challenge, and therefore the learning outcomes for others.

Development of generic skills
The percentage of students who agreed with the statement “The course helped me to work effectively in a team” improved from 58% in 2004 to 76% in 2006. Other indicators of generic skill development remained fairly constant (Q10, Figure 2).

Efficiency for teachers managing the course
Adjusting the number of assignment submissions (see *Student workload* below) has improved marking efficiency, and this could be further improved with the introduction of a computer-based Calibrated Peer Review process, which is under consideration. Changes to group formation has helped to reduce interventions required in that area, and providing better group facilitation processes should further improve efficiency in group management. Additionally, a Frequently Asked Questions page, based on postings on the Help forum, has now been included in the online support.

Collaboration vs. cooperation
Group facilitation processes should be designed to require students to take a collaborative approach to the project tasks, rather than dividing them and working separately. It could be argued that meeting online in an asynchronous environment encouraged a vertical rather than horizontal division of roles (Dillenbourg,

1999), and that explicit instructions for group facilitation (e.g., recommending a rotation of roles) could mitigate that tendency.

Plagiarism
In 2005 a plagiarism activity was introduced to complement the existing online group forming exercise. This involved each student in the group posting their definition of plagiarism and the group then posting a consensus definition of plagiarism. Web links giving definitions of plagiarism were provided to assist students with this activity. This, together with the specified word limit for submissions, largely reduced evidence of plagiarism.

Formative evaluation and feedback
To reduce the demand for 'exam coaching' and increase student involvement in the problem-based work, an adjustment to the relative weightings of group project and exam is being implemented (from 20/60 to 30/50). Facilitation guides now encourage students to reflect on the group learning process. Additional self-test items have also been incorporated in the online tutorials.

Student workload
To reduce student workload for subsequent implementations, the number of submissions for the group project was reduced, and a strict word limit imposed for all submissions. It was found that one part of the project (selection of manufacturing route) overlapped with a project that the students were undertaking in a concurrent companion course, so this part of the project was deleted.

To ensure equivalent workload for each topic, the three separate components of the item (e.g., golf club head, shaft and handle) that each group must examine were specified. To provide as broad as possible a learning experience, the components specified were chosen so as to require quite different course material to be evaluated in each case.

Group number was increased to five to allow for some attrition, and an arrangement for penalising non-participants by removing them from the grading of individual submissions has been effective in giving the group more control over grading for individual members. Improved facilitation processes now address the issue of load-sharing by encouraging a collaborative rather than co-operative approach.

Conclusions

Introduction of a collaborative, problem-based project appears to have improved student engagement and helped to develop generic skills. There was however no significant effect on overall grades; the project serving mainly to lift lower-performers. Some negative impact on teacher workload was experienced, with time spent in facilitating and marking the group work not compensated by the reduction in lecture hours. The implementation of online tutorials to enhance flexibility was successfully achieved, and they have been consistently rated by students as one of the most popular and effective aspects of the course.

The course developers are satisfied that the aims have been achieved, and the online project is already being used as a model for other courses. There is still work to be done, notably in supporting group formation and facilitation, and promoting the horizontal division of project tasks, to help more students have a positive group-work experience.

Alignment of assessment, and the weighting of group activities remains an issue – as long as assessments are largely based on demonstration of low-level mastery of specific knowledge and skills (such as in examinations), what the students do, and therefore what they learn, will be driven by that.

References

Biggs, J. (1999). What the Student Does: teaching for enhanced learning. *Higher Education Research & Developmen*t, 18(1), 57–75.
Box, V.J., Munroe, P.R., Crosky, A.G., Hoffman, M.J., Krauklis, P. & Ford, R.A.J. (2001). Increasing student involvement in materials engineering service subjects for mechanical engineers. *International Journal of Engineering Education*, 17(6), 529 –537.

Clouston, T. J. (2005). Facilitating tutorials in problem-based learning: students' perspectives. In P. Hartley, A. Woods and M. Pill (Eds.) *Enhancing Teaching in Higher Education: New approaches for improving student learning.* London: Routledge Taylor and Francis Group.
Dillenbourg, P. (1999). What do you mean by collaborative learning? In P. Dillenbourg (Ed) *Collaborative-learning: Cognitive and Computational Approaches.* (pp. 1–19). Oxford: Elsevier
Gibbs, G. (1992). *Assessing more students*. Oxford: Oxford Brookes University.
Felder, R.M. & Brent, R. (1996). Navigating The Bumpy Road to Student-Centered Instruction. *College Teaching*, 44(2), 43–47. http://www.ncsu.edu/felder-public/Papers/Resist.html.
Hannafin, M.J. & Land, S.M. (1997). The foundations and assumptions of technology-enhanced student-centered learning environments. *Instructional Science*, 25, 167–202. Kluwer Academic Publishers.
Herrington, J., Sparrow, H. & Herrington, T. (2000). Instructional design guidelines for authentic activity in online learning units. In J. Bourdeau, & R. Heller (Eds.), *Proceedings of EdMedi.* (pp.400–405). Charlottesville, VA: AACE.
Hogan, C. (1996). Getting the students to do the reading, think about it, and share their ideas and responses. In J. Abbott & L. Willcoxson (Eds.), *Teaching and learning within and across disciplines*. (pp. 79–81). Perth: Murdoch University.
Hogan, C. (1999). Semi-autonomous Study Groups. *International Journal of Educational Management*, 13(1), 31–44.
Knowles, M. (1975). *Self Directed Learning*. Cambridge Adult Education, Englewood Cliffs, NJ: Prentice Hall.
Kolb, D. (1984). *Experiential Learning*. Englewood Cliffs, NJ: Prentice Hall.
Livingstone, D. & Lynch, K. (2000). Group Project Work and Student-centred Active Learning: two different experiences. *Studies in Higher Education,* 25(3), 325–345.
McAlpine, I. (2000). Collaborative Learning Online. *Distance Education,* 21(1), 66–80.
Oakley, B., Felder, R.M., Brent, R. & Elhajj, I. (2004). Turning student groups into effective teams. *Journal of Student Centred Learning*, 2(1), 9–34.
Salmon, G. (2001). *Creating the e-learning experience (Which way is forward?).* Plenary Address to BEST conference, April 2001, Windermere, UK.
Sparrow, L., Sparrow, H. & Swan, P. (2000). Student centred learning: Is it possible? In A. Herrmann and M.M. Kulski (Eds.), Flexible Futures in Tertiary Teaching, *Proceedings of the 9th Annual Teaching Learning Forum*, 2–4 Feb 2000. Perth: Curtin University of Technology. http://lsn.curtin.edu.au/tlf/tlf2000/sparrow.html.

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Spatial imaginings: Learning and identity in online environments

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"I have been thinking about space for a long time" are Doreen Massey's (2005, p.3) words that have captured my imagination to explore online learning spaces and places as experienced and used by learners. This paper opens up a space to explore the intersections of spatiality, identity and online learning, drawing on concepts from geography and actor-network-theory (ANT) originating in science and technology studies, using a relational socio-material perspective. I argue for 'spatial imaginings' that are more generative if space/place is conceptualised relationally. Through three vignette snapshots as part of a larger ethnographic study within an Australian university, I explore issues of learner identities and their learning practices in relation to pedagogical, physical and online spaces/places. These socio-material explorations can enrich our understanding to challenge existing views of space, time and place as bounded, fixed and stable. The emergent conceptual insights can inform the work of educational designers, online educators and educational theorists to better understand online learners and their diversity and the socio-material complexities and hybridities of pedagogical, physical and online learning spaces/places.

Keywords: spatiality, learning spaces, online learning spaces, metaphors, qualitative methods, Actor-Network-Theory, ANT, hybridity, space/place, flows, identity, learning

Introduction – opening up the spaces

"I've been thinking about space for a long time" (Massey, 2005, p.3). Like Massey, I too have been contemplating the complexities of analysing emergent learning spaces − the intersections of online and physical spaces/places (Al-Mahmood et al., 2006). In this digital age of e-learning, learning can occur in a variety of spaces and places, where we can have "learning as taking place outside as well as within the taken for granted spaces of the classroom, workshop and lecture theatre [that] bring to our attention not just the question of how our learning is affected by specific features of particular spaces, but also how we as embodied individuals are changed by our experiences in these spaces" (Paechter et al*.*, 2001, p.1). The emergence of hybrid learning spaces/places requires a new imaginary of interpretive frameworks to explore intersections of spatiality, online learning and learners. Online learning prevalence has led to unprecedented possibilities and combinations for learning spaces and pedagogies. How we experience these has an important effect on how we learn as newly emergent online learning technologies facilitate movement across previously bounded categories of space/place. The mantra of e-learning 'any time/any place/anywhere', the "Martini world" as Goodyear (2006) puts it, generates learning environments across multiple locations and combinations.

How are we to think about the relationships between the pedagogical learning spaces of online and offline spaces then? And how can we start to describe the relationship between theses spaces? By moving beyond singular and bounded conceptualisations of space/place to seeing spaces/places as multiple, this paper aims to explore these possibilities using generative metaphors to consider what we take as "a unique space to be a *mixture* of distinct spaces" (Moreira, 2004, p.55). Perhaps more aptly in Massey's (2005, p.19) words the aim is "to liberate 'space' from some chains of meaning (which embed it with *closure* and *statis*,…) which have all but chocked it to death, in order to set it into other chains (…alongside *openness*, and *heterogeneity*, and *liveliness*) where it can have a new and more productive life" (emphasis in original). This paper addresses the issue of learning spaces/places in online learning environments − lived spaces and learning spaces, to consider spaces/places as hybrids of relational flows. This requires seeking "cartographical imaginings" (Edwards & Clarke, 2002, p.168) or spatial imaginings using the notion of "relationality" (Cooper, 2005), where entities come into being through relations. To build on this relational world view of flows, I gather together generative concepts from the areas of Geography, Actor-Network Theory (ANT) within Science and Technology Studies and Education to enrich our conceptualisation of the intersections of identity, online learning and spatiality, and importantly their co-constituting nature. First, a brief literature review of space/place concepts is necessary and an expansion on the notion of relationality and ANT concepts are outlined, followed by a brief description of the larger ethnographic study. This is followed by data story vignettes to illustrate conceptual workings to provide generative metaphors towards understanding spatiality, identity and online learning practices in new ways from a socio-material perspective.

Space/place conceptualisations

The terms space and place may seem innocent enough, but have been cause for fruitful discussion amongst philosophers and educational philosophers (e.g. Malpas, 2004; Burbules, 2004) respectively, geographers (e.g. Crang & Thrift, 2000; Castells, 1996; Thrift, 2006; Lefebvre, 1991) and many others, but perhaps less so by educationalists, with some exceptions (e.g. Nespor, 1994; Edwards & Usher, 2003; Mcgregor, 2003). Massey (2005) and Burbules (2004) make the distinction between the abstract concept of space and the personalised notion of place: a space becomes a place when it becomes socially relevant and meaningful to a person. The more pedestrian notion of space/place is "as closed. Coherent, integrated as authentic, as 'home', a secure retreat; …as somehow originarily regionalised, as always-already divided up" (Massey 2006, p.6). However, Massey points out that we have failed to think explicitly about space and to take on board and deal with its "constitutive complexity" (Massey, 2005, p.8). We need to move beyond the "distinction, all too appealing it seems, between place (as meaningful. Lived and everyday) and space (as what? The outside? The abstract? The meaning*less*)?" (Massey, 2005, p.6). This means moving from the "single narrative" to "a multiplicity of trajectories" to consider the readings of what space might be in its multiplicities and its constant construction. Massey's conceptualisations of space/place provide generative relational views to consider a space–time dynamic, where space is not out there to be experienced, but rather is co-constructed or performed relationally, and is in a constant process of being made and remade.

This relational view also invokes a material turn towards space/place (Thrift, 2006) to open up other sensibilities that look at the world socio-materially. By using the tool of Actor-Network-Theory (ANT) with its Latourian origins and multiple iterations (e.g. Callon,1986; Latour, 1987; Law & Hassard, 1999; Latour, 1997; Latour, 2005; Law, 1999), the focus is on the socio-material relations or processes, which provide analytical power through socio-material assemblages. So instead of a world of essentialised categories and binaries, the world is a 'heterogenous' world of 'hybrids' (Bingham & Thrift, 2000, p.287), where entities of things, people, and nature combine in network assemblages. So what does this open up for us − this view of space and the world as relational? Basically that "There is much more 'space' than our old discontinuous ways of thinking have allowed us to see" (Bingham & Thrift, 2000, p.287), it restores the notion of "multiplicity of the world…" (Bingham & Thrift, 2000, p.289). It is in this vein that I want to address 'spatial imaginings' of the practices and relations that construct online learning spaces/places and learners. But first, we need to consider identity constructions in this world-view.

Relationality – spaces and identities

From a relational perspective then "identities/entities, the relations 'between' them, and the spatiality which is part of them, are all co-constitutive", where identities become "*spatio*-temporal", and "identity may be conceived as an ongoing process of hybridity, in which one's sense of self is continuously made and re-made" (Massey, 2005, p.10). This means that identities are performed, and represents what is known as the performative turn (e.g. Nash, 2000; Gregson & Rose, 2000; Goffman, 1971; Thrift, 2006). And so, here "Relations are … materially heterogeneous. They take the forms that they do, if they do … because they are performed, held in place, in a variety of different media: words; bodies; texts; machines; buildings. All mixed up. Materially heterogeneous" (Law, 1999, p.7). This surfaces events in their complexity rather than in reductive simplified manners. Another way of saying this is through a geographic lens as Crang and Thrift (2000, p.9) creatively describe:

> … the world has become full of things, objects of all sorts that can be taken up and used to create senses of the self. For example, bound together as (in most cases) shifting and incomplete projects, collections of objects offer ways of connecting to other times and places, to shape a sense of ourselves. These personal material maps, these 'autotopographies' (Gonzales, 1995), bind the self into the world. Selves do not occur

> performed, nor do they even 'interact' with the world as though self and world were pre-existing entities rubbing at the edges. Rather selves are created through as Heidegger would have it, being-in-the-world. Boundaries are not the limits of self but rather they create the sense of self.

By using the concept of hybridity to explore space as flows, we can enrich conceptualising the world of learning as the boundaries of home, work, study and retreat spaces/places are being reconfigured where "some borders are being dismantled, some renegotiated, and yet others being created (Massey, 2005, p.179). And so what of these online learning spaces/places?

Pedagogical online learning spaces/places

Online learning spaces (cyber and physical) challenge the traditional notions of habituated everyday bounded learning environments. Land (2004) notes the complications that are rendered when the "digital page" or online university disrupts the "immured academy" and suggests that cyberspace or online space "remains difficult to define as a learning space" (Land, 2004, p.530). And that indeed "Cyberspace could well be a non-space" (Land, 2004, p.532), but as I will suggest it can certainly multiply beyond that if we take on Massey's conception of space/place and the hybrid possibilities. It is the richness and multiplicity of the intersections of online and physical spaces that is generative. As Kitch (1998) aptly highlights that:

> cyberspaces do not replace geographic spaces, nor do they destroy space and time. Rather, cyberspaces coexist with geographic spaces providing a new layer of virtual sites superimposed over geographic spaces. Geographers are well placed to study the interplay between virtual worlds and geographic spaces. At the points of this interplay, spatial transformations are affecting social relations while simultaneously social transformations are affecting spatial relations.

Here the notion of co-constituting components is a crucial feature of a relational socio-material world-view. Consequently 'cyberspace' or online space can be seen as different kinds of spaces as "internally multiple" (Bingham, 1996 cited in Massey, 2005, p.91). Massy invites us to consider "what kinds of multiplicities (patterning) and relations will be co-constructed with these new kinds of spatial configurations" (Massey, 2005, p.91). It is armed with these definitions and conceptualisations that I move from theoretical conceptualisations to their practical applications.

Exploring online learning spaces – spatial imaginings

This research draws from a larger ethnographic study (in a large Australian university) (as part of my PhD study) of four fully online postgraduate subject modules with no face-to-face interaction. The study used ethnography to provide rich data, and the data collection methods included interviews, participant observation, photographic data and reflection over a period of 6–10 months, with data collected from 24 participants, 19 postgraduate online learners and 5 staff (names disguised). Studies so far have been sparse on exploring intersections of identity, spatiality and online learning experiences, with a few exceptions (e.g. Paechter et al., 2001; Edwards & Usher, 2003), and rarely from a socio-material perspective, which is why the relational methodology framework of ANT was chosen, to surface the material, the socio-material and the 'missing masses' (Latour, 1992), to move beyond the purely social or the purely technical and surface complexity as distinct from reduction. I now concentrate on three illustrative multi-textual data vignettes which together convey a brief relational socio-material analysis of the intersections of spatiality, identity and learning in online environments.

Vignette 1 Regionalised spaces – "This is the house of learning where desks and books shape you"

Robert emphasises the importance of learning to his family: "I mean both our kids, all through their life, they're 18, 19, have seen us [referring to his wife also] we've always had our own desks our own study environment, so to actually study is a bit of a way of life in our family."

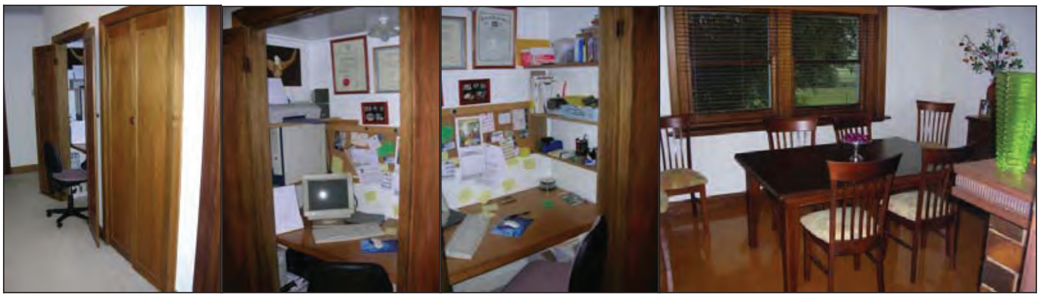

Figure 1: Robert's study spaces

Robert says about his study spaces in figure 1 *"426, 425 & 424* [referring to images] are of the 'study nook' made out of a cupboard in the hallway. As I said this is supposed to be my study but as the computer is there (and everyone wants to use the compute/internet) I did most of my study on the dining room table!! 422 is the dining room table!!"

Robert in an interview segment about his online learning experience says:

> You're a bit powerless; … it's take it or leave it, you know. This is the way we do business…And I suppose that's like home because we've only got one computer in a little ... and this is between my wife, and myself, and two boys, we've only got one computer. But the interesting thing is that we've actually got our own desks and our own study areas. My wife's got a desk, got desks in our room, the two boys have got desks in their rooms, and then there was this study that we've converted out of a cupboard, which was my study but I've never been able to [access it]… I mean that's why I get cross from time to time, because 'Everyone wants my study' where the computer is. I've actually over the last twelve months, I've actually had to do all my study on the dining room table …but my study, our study, we've got quite a wide hall, with three cupboards … and I've converted one of these cupboards, into a little study nook, and that's where the computer is.

Robert talking about the online learning space in an interview says:

> It's just a maze trying to find…Navigating your way through, from the previous year in there and I just found it, it's probably me, because I'm a bit older, but I just found it a real maze and it took me a couple of weeks to remember, how I got through to the site where it actually had the tasks and to actually post your task responses, you know what I mean, the activity responses, to do the online chat in just this teeny poky little box, that you had to write in, um you know if you wanted to highlight things or it didn't have the functionality of something like Word…

Robert mentioning the possibilities of the WWW which he doesn't explore though but is keenly aware of:

> …and if you wanted to…I mean the power of the web in terms of actually being able to go out into the world and access a whole lot of different material is just incredible and my guess is…you probably don't need to go to libraries anymore, you can just wander around the world. But I'm sure you could find other material, other course notes from all around the world…

Robert who is a senior manager living in a rural region of Australia, is a highly and multiply qualified lifelong learner. Roberts' vignette starts with the importance of desks and books and learning as having always been a part of his family's life ever since he could remember. His physical space is highly regionalised or territorialised, with each family member having their own study space, this so to speak has been part of their family structure for as long as he can remember. However, his 'pride and joy' study that he built in the hallway within a cupboard houses the computer which becomes a contested region fought over by other family members. So even though physical spaces are territorialised as belonging to different family members, Robert seems to end up studying at the dining room table, as there is only one computer to share amongst the family! The physical spaces demark belongings amongst his family members and he acquiesces to their needs. Robert is extremely protective of the boundaries of home and work, inside and outside, in that he tries not to bring work home. Similarly his view of the online learning space he inhabits is one of territory and boundedness, ensuring that he remains within the online pedagogical space, where he refers to the online world as a maze with possibilities of getting lost in the online space. Even though he confines himself to the online space of the subject course, he comments on his full awareness of what the web can offer in terms of "wandering around the world", but he doesn't venture through "the maze" for fear of getting lost. So for Robert there is this demarcation of inside-outside in his physical and online space habitations. He sets clear boundaries in these spaces that are important for preserving roles, identities, responsibilities and work modes. His positionings are inward and more reminiscent of "spaces of enclosure" (Lankashear *et al*., 1996). His appropriation and learning practices of the online learning space is that he 'moving through' space, as Maglio and Matlock (1999, p.67) comment "(a) *web space is physical space*, which reflects how users view the web as a place; and (b) *obtaining information is moving through space*, which reflects how users view themselves as moving along paths to information objects" (emphasis in original). The notions of bounded regions and territories for Robert help keep the family roles and spaces stable, although he expresses the desire to be "forced/coerced" to explore other online spaces. For Robert, keeping the boundaries stable and less porous provide him with structure and capacity to sift through and order information and his spaces to allow him focus – for him there is an outside and inside world of boundaries that remain distinct. In this sense, in ANT terms this can be viewed as a regionalised topography (Law & Mol, 2001; Moreira, 2004).

Vignette 2 Networked spaces – "The sad and the sacred"

Paul's insights are revealed below:

> And in martial arts there is, it comes from a Buddhist tradition of the almost you could say the sanctity of the learning space and I really value the traditions that are associated with that, which is that you bow at the entrance to the learning space and that is a demonstration of your respect for the space, and for the process and the teacher and everything involved in it and so I am very conscious in my own language teaching of the space that has been created in the class. The physical space of the classroom and of, I suppose, the energetic space that the teacher creates and holds in teaching. And yes, I am not conscience of that stuff happening when I am in an online environment. I think what can happen, I think what a good teacher can do, not just online but in any sort of distance learning situation, is create some sort of relationship with the students and I think that is what Marvin [one of the online educators] did quite well, so that the student in some manner feels like … the verb that, the best verb for me is that they are being held in some manner. And I guess that is what value in a course when you don't have the possibility of a teacher to stand there, is that somehow you replicate that personal relationship that a teacher brings to the classroom.

In another interview segment:

> Yes, and it's … you know, what works for me as a learner, as a student, is to … it is almost the ability to rest in space that has been created for me by a teacher. And so that, you know, I know when I go to my martial arts club that I am entering a space that someone has created for me, that the teacher has created for me, and that I … there is something very … I feel very supported in that environment and I can feel cared for and I feel that some of my responsibility is taken away. My responsibility to be a functioning self-directed, self-determining adult, professional, parent – all those things that I have to do, all day, every day and it is not that it is a child-like position but it is that somehow some of my kind of … the baggage, the weight of the self is removed and I can just kind of go and do what I do without having to particularly think and take responsibility for myself and … I find that to be very valuable. And I think I do some similar sort of thing for my students, and it could be just a phase that I am going through in my teaching, but it is what I have been doing for the last few years. It is about creating a safe place for my students, a safe, predictable space, where they come in … where I'm … it's not the fact that I'm in charge, it's not the fact that I am directing and controlling it, but it's that I am kind of holding it and taking

> responsibility for it, and kind of inviting people to come and rest in that space. And that sounds very space, cosmic, you know, touchy feely …but…

And from an interview segment, Paul highlights

> …that notion of holding the class, I think, is really important, and you know, think actively about how you can achieve that effect online.

In a further interview segment, he says:

> Yes, being a novice and being in someone's territory that wasn't my own and that, you know, maybe I was a bit of a fraud by being there because I was just desperately trying to work out what was expected of me and not really knowing. Whereas Part Z, and perhaps this sort of, you know, what I was saying before about the professional persona that I was embodying in the forum, it gave me, you know, I was more comfortable in that. So, yeah, Part Z was … I think it has been fairly important for me in the other coursework that I have done, that, you know, because it is not an undergraduate subject, it is a, postgraduate subject and I have been a teacher for 20 years and so it is actually fairly important to me that … I can bring that to what I am doing. And there was that opportunity in Part Z and I felt that Marvin was quite respectful of our experience and knowledge… That would've been nourishing is the word that comes to mind.

What of Paul's home learning spaces? Paul comments in an email on his home study space where he accesses the online subject:

> The space in which I work is located at the back of the house. It is essentially a thoroughfare – the door behind the desk in the photo leads into the laundry. The space also opens onto the kitchen, the toilet and the back yard. It is, in a word, unsatisfactory: too much noise, constant traffic, no privacy and insufficient space, a product of too many people living in too small a house. The advantage – perhaps not the right word – is that its proximity to the rest of the house means I am perhaps more inclined to sit down and work for ten minutes on some small idea that occurs to me while cooking, cleaning etc. Indeed I tend to study that way, in numerous short spells, rather than for a concentrated, prolonged period. It is quite ironic that I should bang on about the sacredness of learning space, when my own 'refuge' is so beleaguered – or maybe it's no coincidence at all.

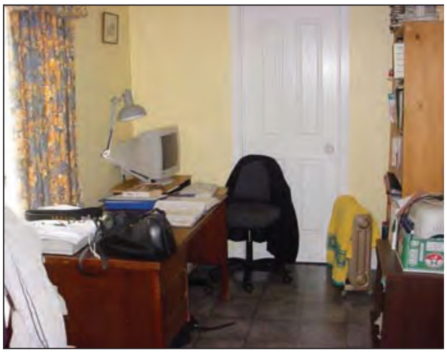

Figure 2: Paul's home learning spaces

And Paul's response when commenting on the online subject:

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

When asked about where he felt he was in the online subject? Paul comments:

> …That's an interesting question …[deep thoughtful and reflective pause] That's a very interesting question. There was, I mean it was … the forum was an interesting sort of thing because, I mean, you were … I was writing to other people who were presumably … professionals and postgraduate students so, yeah, there was a bit of "this is my professional environment" and there was some status and pride to be protected in talking about that.

> Yes, that is interesting. I think I realise, and I hadn't thought about this before but I guess what I was doing in writing those forum entries each time was being fairly careful to show that I was, you know, competent and articulate and thoughtful and that this was my domain that I was working in and I have quite a bit of expertise about this and you know, I'm a teacher and I'm a professional. So, yeah, there was that element of ' performance' …

When Paul is asked about his perception about the online learning space, he comments:

> I don't actually know that I have a sense of being in a space when I am in the virtual world. I don't really …That I am working at the time? I find it hard to find an answer to that question I would have to say. I think I probably, I mean I think the computer for me is … yes I don't know. I don't know if I can answer that…It is, yes, and I realise that and I think for me, I have a very strong sense of the teaching space, of the physical teaching space. For me it is a really critical part of my teaching …

Paul is a professional teacher with over 20 years experience in teaching and also in martial arts. He provides some very rich descriptions of his learning spaces in the physical and online worlds. For Paul, the 'sacredness of the teacher–student relationship' is fundamental and should be the basis of any learning interaction. However, he points to the difficulty in producing that in an online learning space, or its lack in his particular online learning experience because there are no relations based on rituals of "creating" or co-constituting a respectful 'space' that becomes a sacred learning place to enter. Drawing on ANT terminology and metaphor, the notion of network where different entities that are distant and close come together (here for example, the martial arts class of 20 years ago and the online subject and physical space, his martial arts teacher, his student identity and his professional identity, to name a few) can be one way to describe Paul's experiences. In network topology, people and things establish their relations with others through circulations of networks. Paul connects or translates his martial arts views of the teacher-student relationship expectations to the online environment, but finds it lacking to a large extent. He talks about the importance of creating a space to be "held" to be "contained", but for Paul the online learning space he inhabits doesn't reach this ideal. His sense of being in a "place" is absent in the online learning environment. In some way, the contrast with his physical space, which acts as a thoroughfare, seems to create this yearning perhaps for the ideal. His need is for embodied online relational presence of the teacher to engage in creating a sacred learning-teaching place. But for Paul, the online space never becomes a learning 'place', and he remains with feelings of extreme isolation and loneliness during the online subject.

Vignette 3 Fire spaces – "The flickering nomad – no one in particular to multiple hybrids"

> My study is a bit like my whole being, it's a space where lots of different work gets done. Yes the online subject space, but I also accessed that from other university spaces or friends' homes if I was away for a weekend. But my study space is a kind of everything space where all parts of my life come into it – the academic, the social, the professional, and sometimes the space just blurs and I have to decide that I'll only stay in an academic space or whatever, but more often than not I furiously multitask. It's also a creative space…It has books, papers, and all sorts of artefacts in it too. I like to have a lot of stimulating things around me to inspire me…

Figure 3: Maheen's study space adjacent to her computer desk in her study

She also comments:

> Inevitably for me there is great resistance to feeling confined in an online subject space. I don't like feeling restricted by a structure … it must be the radical element in me. I guess I want to explore, to travel to move to other worlds, to maximise the whole experience of being on the Internet.
>
> …For me I loved being able to flick in and out of the online space and the physical space, so yes I would take walks and think about what I had read just to get away from feeling like a 'cyborg' I really started to live online almost while I was doing the subject as an online student!
>
> …It's funny I think I did more surfing [online] when I was doing the online subject because I felt that I should keep exploring, and I would meander and explore other sites related to the subject. Although because I spent hours exploring the subject and other resources that I'd find, I would also take breaks online! I would equate these to coffee breaks or something like that. In fact, I really did go to a place called "Soul Food Café" which is a fantastic creative writing space. I also ended up finding academic blogs and other blogs related to the subject area and yet all of these were well beyond the boundaries of the online course…

Maheen responding to the question: And who did you feel you were in the subject online space?

> ...In some ways it's a bit like this neutral mask in my study, I could be no one in particular or a take on any of my identities from learner to professional to expert and so on…or a multiple of them…blurring in and out...if you like…or blending them…morphing them so to speak…I tend to feel quit comfortable with hybrid moves if you like…don't really like singularity…it eliminates possibilities for me…

Maheen's ability to multitask:

> The interesting thing was I was somehow present and yet absent, so I could be sitting in the study space inhabiting the online learning space, but I would simultaneously be multitasking or something, so for me the learning process became multiple, reading 3 separate email interfaces, doing the online subject, taking online breaks, and then physically leaving the space…

Maheen comments on the need to create a sense of liveliness in-the-moment feel in her online course:

> It was in some ways quite intense and yet I needed that to give me a sense of dynamic in-the-moment feel, when so much of the interaction was asynchronous. It gave me a sense of being able to network and a sense of breathing space, I guess I was looking for sources of inspiration …For me the virtual space was a place to transcend and be suspended in a space…it somehow felt like I was in this other space, I would forget that I was in a physical space and be in a state of 'flow' almost or transported to these other fascinating websites… I'm not sure if everyone feels that…there were times where I was so immersed that I'd forget the boundaries of my skin…quite an extraordinary experience, as if I'd dissolved, but not due to anything I was reading in the subject site…as if my eyes were not just glazed by the screen but mesmerised by where I was suspended and going online…I kept thinking of Donna Haraway and would joke to friends that I was becoming a 'cyborg'!

Maheen is a full-time postgraduate student who recently gave up her full-time work position, but continues to work professionally and teach at tertiary level. Maheen's spaces are indeed multiple and hybrid. One way of viewing her experiences of her spaces drawing on generative ANT metaphors can be through the topology of fire (Law & Mol, 2001; Moreira 2004), as this best describes her movements in the hybrid spaces. Whilst she is bounded in a regional physical study space, also multiple though, which she describes as having multiple spaces imposed on it − the creative, professional and academic − this multiplicity is reflected in how she experiences the online subject and her online movements and meanderings. She flicks in and out of online sites to get further resources, to be inspired and to create a sense of the 'dynamic' – needing to move beyond the static – to feel a sense of liveliness to accommodate the asynchronous text-based interactions. Her flickerings between the various spaces, her absences and presences are fire-like in an ANT sense, where "in a fire space a shape achieves constancy in a relation between presence and absence: *the constancy of object presence depends on simultaneous absence and alterity*" (emphasis in original) (Law and Mol, 2001, p.161). The topology of fire allows one to 'flicker' between worlds. Maheen epitomises the hybridity of her spaces and identities, and the blurring and blending, where she even loses the sense of skin boundary at times with "dissolving" of her skin. This is akin to what Haraway asks: "why should our bodies end at the skin, or include at best other beings encapsulated by skin?" (Haraway, 1991, p.178.) Maheen's hybrid spaces can be seen as a "partial connection in which all kinds of constantly shifting spaces can co-exist, overlap and hybridise, move together, move apart" (Bingham & Thrift, 2000, p.299). Space and places multiply in different hybrid forms depending on presencing and absencing, the notion of "flickering topographies" (Thrift, 2006, p.140). For Maheen, her spaces indeed become places because of their significance and their meaning because of their functionality as places to take breaks, explore, travel and so on. In Maheen's learning spaces, there are nomadic fire movements that fan the dynamic feel of presence in her multiple hybrid learning spaces to become learning places.

Conclusion – spatial imaginings, so what?

In summary, some important conceptualisations can be drawn, namely that a socio-material lens can provide additional ways, beyond the cognitive and the technical, to analyse online learning in terms of spaces, identities and learning practices. This relational socio-material approach helps lift the 'invisible' masses to view and highlights the '*hybrid collectifs'* (Callon & Law, 1994) of learning-identities-spaces as co-constituting, where the boundaries of each can be (re)made. The notion of boundary can serve as a useful device for thinking of the process of enclosed locales and open spaces as it allow us "to compartmentalize to find order and yet it is also in the transgression of boundaries that we find creativity…"(Zerubavel, 1991, p.118). The notion of boundary creation is what helps us view the online vignettes described as processes of (re)configuration that move from enclosed boundaries in the first vignette to transgressing boundaries in the third vignette. The notion of how the boundary is formed and transgressed is what makes online environments as "'neither here nor there but both here and there' a (dis)location – something that is both positioned and not positioned, (dis)placed but not replaced, a diaspora space of hybridity and flows where one and many locations are simultaneously possible" (Usher & Edwards, 1998, p.3). Consequently online environments can be viewed as a heterogenous spaces of hybrid 'flows'. To map these flow patterns/processes between stasis and movement, the ANT concept metaphors of regions, networks, fluids and fire (Law & Mol, 2001), can be productive to look at online learning processes with a socio-material sensibility. Using these metaphors allows for conceptualising the internal dynamics of spaces as the effect of interferences/intersections between different types of spaces and entities and are generative of the learning event. What becomes clearer is that learners in online spaces inhabit various spaces – institutional spaces to non-institutional spaces and spaces "in-between" (Bhabha, 2001). The use of electronic media provides for this "pluralizing 'setting'" where "place is instantaneously pluralized" (Moore, 2005; see also Moore, 2004). We need to understand much more about the dynamics of plurality, hybridity and the complexities of online learning environments, and as Goodyear (2006) points out, "We need appropriate physical spaces, as well as appropriate digital ones. We also need a better integration between the material and digital world…" (p.95).

In conclusion, online learning can be viewed with a new imaginary that takes in the socio-material world to provide new spatial imaginings through Massey's powerful notion of space as 'flows'. By drawing on the rich areas of sociology of Science and Technology Studies and new geographies of space and place, we can open up different ways to think of learning, spatiality and learners in online environments. What these brief introductory vignette analyses show is that spaces/places are in fact hybrids and it is generative to view them relationally. It is no longer productive to think in binary terms of offline/online spaces (Leander & McKim, 2003), but rather of hybrid spaces of flow. These ANT topological metaphors allow for enclosed and open spaces, and 'spaces-in-between' "based on 'points of encounter', contact zones, 'borderlands' and 'hybridity'…" (Crang & Thrift, 2000, p.19), which can provide a way "To live, to know and to practice in the complexities of tension" (Law, 1999, p.12).

This paper has sought to explore the intersections of the who, where and how of online learners and online learning related to the conference theme, aiming to open up "spaces which have been closed down" (Bingham & Thrift, 2000, p.299). If we take Massey's relational view of space seriously then we are always, "inevitably, making spaces and places", where these spatial forms shape and shift our identities (Massey, 2005, p.175), in a world that is made up of places (Snyder, 1990, p.25). These notions of space/place, identity and learning intersections can inform online educators, educational designers and philosophers of the need to consider complexity and hybridity issues in designing and analysing online learning environments and experiences. So for example, how might we be able to provide online environments that allow for public and private spaces, for 'sacred rituals' of entry beyond passwords, to open, creative, inspiring and exploratory spaces? How might we change online learning spaces into places? We need to find ways to imbue our online learning environments with a liveliness of space (Massey, 2005,p.189), by invoking Lefebvre's notion that: "To change life is to change space; to change space is to change life" (Merrifield, 2000, p.173). Finally, having started with my fascination for Massey's words, I want to end with her enticing words to invite further explorations of spatiality, identity and online learning, because "What space gives us is simultaneous heterogeneity; it holds out the possibility of surprise" (Massey, 2005, p.105). Let us open up the spaces for these spatial imaginings.

References

Al-Mahmood, R. Goodacre, C. & Applebee, A. (2006). Learning and teaching spaces in the digital age – Build it and they will come? Provoking reflections. *HERDSA News, Apr*, 5–11.

Bhabha, H. (2001). Locations of Culture: the post-colonial and the postmodern. In S. Malpas (Ed.), *Postmodern debates*. Basingstoke: Palgrave.

Bingham, N. & Thrift, N. (2000). Some new instructions for travellers: the geography of Bruno Latour and Micehl Serres. In M. Crang & N. Thrift (Eds) (2000). *Thinking space*, (pp.281–301). London: Routledge.

Burbules, N. (2004). Rethinking the virtual. *E-learning, 1(2),* 162–183.

Callon, M. (1986). Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay. First published in J. Law, *Power, action and belief: A new sociology of knowledge?* (pp.196–223). London: Routledge.

Callon, M., & Law, J. (1995). Agency and the hybrid collectif. *South Atlantic Quarterly, 94(2),* 481–507.

Castells, M. (1996). *The information age: Economy, society and culture volume 1: The rise of the network society.* Maldon, MA: Blackwell.

Cooper, R. (2005). Peripheral vision: Relationality. *Organization Studies, 26(11),*1689–1710.

Crang, M. & Thrift, N. (2000). Introduction. In M. Crang & N. Thrift (Eds) (2000). *Thinking space,* (pp.1–30). London: Routledge.

Crang, M. & Thrift, N. (Eds) (2000). *Thinking space*. London: Routledge.

Delueze, G. (1992). What is an event? In *Fold, Leibniz and the Baroque*, (translated by Tom Conley), the University of Minnesota Press. http://acnet.pratt.edu/~arch543p/readings/Deleuze.html [Accessed Online 12 July 2005].

Edwards, R. & Clarke, J. (2002). Flexible learning, spatiality and identity. *Studies in Continuing Education, 24 (2)*, 153–165.

Edwards, R. & Usher, R. (Eds) (2003). *Space, curriculum, and learning*. Greenwich, CT: Information Age Pub.

Goffman, E. (1971). *The presentation of self in everyday life***.** Harmondsworth: Penguin.

Goodyear, P. (2006). Technology and the articulation of vocational and academic interests: Reflections on time, space and e-learning. *Studies in Continuing Education, 28 (2),* 83–98.

Gregson, N. & Rose, G. (2000). Taking Butler elsewhere: performatives, spatialities and subjectivities. *Environment and Planning D: Society and Space, 18 (4)*, 433–452.

Hall, S. (1996). Introduction: who needs 'identity'? In S. Hall & P. du Gay (Eds), *Questions of cultural identity*, (pp. 3–17). London: Sage.

Haraway, D. (1991). A cyborg manifesto: Science, technology, and socialist-feminism in the late twentieth century. In *Simians, cyborgs and women: The reinvention of nature*, (pp.149–181). New York: Routledge.

Kitch, R. M. (1998). Towards geographies of cyberspace. *Progress in Human Geography, 22 (3),* 385–406.

Land, R. (2004). Issues of embodiment and risk in online learning. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds), *Beyond the comfort zone: Proceedings of the 21st ascilite conference,* (pp.530–538). Perth, 5–8 December. http://www.ascilite.org.au/conferences/perth04/procs/land.html [Accessed 8 July 2005].

Lankshear, C., Peters, M. & Knobel, M. (1996). Critical pedagogy and cyberspace. In H. A. Giroux, C. Lankshear, P. McLaren and M. Peters (Eds.), *Counternarratives.* London: Routledge.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge, Mass: Harvard University Press.

Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artefacts. In W.E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change,* (pp. 225–258). USA: MIT Press.

Latour, B. (1997). Trains of thought: Piaget, formalism, and the fifth dimension. *Common Knowledge, 6 (3),* 170–191.

Latour, B. (2005). *Reassembling the socia: An introduction to actor-network-theory*. Oxford: OUP.

Law, J. & Mol, A. (2001). Situating technoscience: An inquiry into spatialities. *Environment and Planning D: Society and Space, 19*, 609–621.

Law, J. (1999). After ANT: complexity, naming and topology. In J. Law & J. Hassard (Eds.), *Actor network theory and after*, (pp. 1–14). Oxford: Blackwell.

Law, J. & Hassard, J. (Eds) (1999). *Actor network theory and after*. Oxford: Blackwell Publishers.

Leander, K. M. & McKim, K. K. (2003). Tracing the everyday sittings of adolescents on the Internet: a strategic adaptation of ethnography across offline and online spaces. *Education, Communication & Information 3 (2),* 211–240.

Lefebvre, H. (translated by Donald Nicholson-Smith) (1991). *The production of space*. Oxford, UK: Blackwell.

Maglio, P. P. & Matlock, T. (1999). The conceptual structure of information space. In A. J. Munro, K. Hook & D. Benyon (Eds). *Social navigation of information space*. London: Springer, pp.155–173.

Malpas, J. E. (1999). *Place and experience: A philosophical topography.* Cambridge: Cambridge University Press.

Massey, D. (2005) *For space*. London: Sage.

Mcgregor, J. (2003). Making Spaces: Teacher workplace topologies. *Pedagogy, Culture and Society, 11(3)*, 353–377.

Merrifield, A. (2000). Henri Lefebvre: a socialist in space. In M. Crang & N. Thrift (Eds.), *Thinking space*, (pp.167–182). London: Routledge.

Moores, S. (2004). The Doubling of Place: Electronic Media, Time–Space Arrangements and Social Relationships. In N. Couldry and A. McCarthy (Eds.), *MediaSpace: place, scale and culture in a media age*. London: Routledge.

Moores, S. (2005). Conceptualising place in a world of flows. In A. Hepp, F. Krotz, S. Moores & C. Winter (Eds). *Connectivity, networks and flow: key concepts for contemporary media and cultural studies.* New York: Hampton Press.

Moreira, T. (2004). Surgical monads: A social topology of the operating room. *Environment and Planning D: Society and Space, 22*, 53–69.

Nash, C. (2000). Perfomativity in practices: Some recent work in cultural geography. *Progress in Human Geography, 24 (4),* 653–664.

Nespor, J. (1994). *Knowledge in motion: space, time, and curriculum in undergraduate physics and management.* London: Falmer Press.

Paechter, C., Edwards, R., Harrison, R. & Twining, P. (Eds.) (2001). *Learning, space and identity.* London: Paul Chapman Pub. in association with the Open University.

Snyder, G. (1990). *The practice of the wild*. NY: North Point Press.

Thrift N, (2000). Afterwords**.** *Environment and Planning D: Society and Space 18*, 213–255.

Thrift, N. (2006). Space. *Theory, Culture & Society, 23 (2–3),*139–155.

Usher, R. & Edwards, R. (1998). Lost and found: 'Cyberspace' and the (dis)location of teaching, learning and research. In *Research, teaching and learning: Making connections in the education of adults*. Paper presented at the 28th Annual SCUTREA Conference, University of Exeter, UK, 7 July. http://www.leeds.ac.uk/educol/documents/000000742.htm [Accessed 10 July 2005].

Zerubavel, E. (1991). *The fine line: Making distinctions in everyday life.* NY: Free Press.

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E-learning: Do our students want it and do we care?

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Early childhood courses at the University of Western Sydney are at a watershed. Program restructuring has embraced the challenges of the changing contexts of Australian early childhood education and the dynamic multicultural, multilingual, multi-aged communities of Western Sydney. These conditions have resulted in the reconceptualisation of the content and delivery of initial and continuing education for early childhood professionals at UWS. This paper will present research conducted by the early childhood staff team as they document and analyse the introduction of new courses using a blended learning approach.

Keywords: technologies for marginalised and disadvantaged

Introduction

This paper reports on part of a larger study, "Using techno-pedagogies to meet the equity challenges facing early childhood teacher education in the 21st Century", which is being conducted by Leonie Arthur, Jean Ashton, Bronwyn Beecher, Ros Elliott, Linda Newman, Roisin O'Reilly, Jen Skattebol and Christine Woodrow at the University of Western Sydney. The aim of the study is to explore new models of course delivery that will address the extreme shortage of appropriately qualified staff in early childhood settings and scaffold academic learning for students articulating to university with the Diploma of Children's Services. These students have been identified by the university as experiencing particular challenges in the transition to university, and are subject to high attrition rates. This paper reports on some of the preliminary findings of this study.

Students attending UWS come from many diverse communities characterised by wide variation in income, culture, language, educational and/work experiences and resources (Western Sydney Regional Organisation of Councils, 2002) so they face many equity challenges. Many are likely to come from the seven most disadvantaged Sydney Local Government Areas within the UWS region according to the SEIFA index of disadvantage (ABS, 2001). These areas are identified by large numbers of people on low incomes where they engage in unskilled work or are receiving unemployment support.

Students enrolled in the Bachelor of Early Childhood Studies in 2005 participated in surveys and focus group discussions. Some of the questions included: What are the challenging aspects of undertaking study at UWS? What are the competing issues facing your study (work, family, life)? If we were to change the way we deliver our courses what suggestions would you make for multiple delivery options? How can university prepare students to undertake flexibility delivered courses and what resources do you think would be necessary?

Findings: Issues for students

One of the key aspects identified by students was financial issues. Students stated that they need to work to cover living expenses and transport costs as well as to earn money to purchase resources. Many are also involved in a balancing act as they care for family as well as work and study, and seek their own timeout (Ashton & Elliott, 2005).

The maturity, life responsibilities and work-place participation of many UWS early childhood students suggests that online learning would assist them to participate in and continue with further study. But how many UWS students are competent users of technologies? Based on general patterns in census data (ABS, 2005), UWS students are likely to have more diverse experiences with technologies than the general population. Residents in greater western Sydney generally have lower rates of computer use than residents of the Sydney Metropolitan Area (UWS, 2003). The Greater Western Sydney Regional Profile conducted by UWS in 2003 found that computer use varies across the region. Residents in the Fairfield, Auburn and Bankstown areas have much lower usage than the Sydney average. Only 30% of residents in both the Fairfield and Bankstown local government areas used a computer in 2003 compared to 45% in the Sydney Metropolitan Area (UWS, 2003).

The data generated by the research into techno-pedagogies currently being undertaken at UWS suggests that current and potential early childhood students have varying experiences and competencies with technologies. Students who are articulating with a Diploma indicated in focus groups that they have emerging ICT skills. Some students do not engage with new information and technologies in their everyday lives and stated that they had to learn how to use a computer when they commenced university study. Others are members of the Net Generation who are experienced with the latest technologies.

International research suggests that many mature age students are not generally confident with technologies and need the support of a face-to-face environment, while younger students may be experienced with technologies yet still prefer a combination of on-campus experiential learning and online study (Brown, 2005). Net Geners like face-to-face social interactions, working in groups and feedback (Oblinger & Oblinger, 2005), suggesting that it is necessary to augment online learning with on-campus experiences. Early childhood students who participated in focus groups in 2005 supported this view. They stated that they value face-to-face contact with lecturers and other students. They saw on-campus sessions as providing opportunities to engage in small group work where they can 'get ideas from others' and 'hear others' perspectives'. Students also highlighted the significance of networking and building team support. Nine of the eleven students in one focus group agreed that they "would be scared to loose face-to-face".

Conclusions: Blended learning in the early childhood course

We were quite surprised, and a little taken aback, when many of our net-generation students, considerably younger than most of us, told us strongly that they preferred face to face delivery, wanted to come to uni as a way of providing personal and physical space for themselves, and were very nervous about the introduction of e-learning. We were confronted with an ethical dilemma. Should we assert our autonomy over our students? Should we impose a maternalistic 'we know what's best for you' approach, despite their obvious concerns and very real economic and ICT experience constraints? We needed to prioritise potential benefits versus possible harms or risk of harm. We needed to maintain the faith and trust of our students if the changes were to be beneficial rather than detrimental. We needed to balance short term harm, loss or inconvenience against long term benefit.

On balance, after considerable reflection, we made an ethically based judgement that the long term benefits for our students as professionals, for the early childhood profession, and for the children and families our students would work with outweighed the short tem issues. Briefly, our rationale was supported by our knowledge that in a complex and rapidly changing globalised world it is critically important that teachers and teacher educators engage in debate, decision-making, new knowledge creation and action for change using ICTs within a heutagogical approach for lifelong learning (Ashton & Newman, in press). Our flexible and blended approach would allow us to introduce new ICT approaches along with traditional classroom interactions (Collis & Moonen, 2001). This gives students time to work and attend to life's other demands while, as Marsh (2001) suggests, increasing their learning and improving retention rates. All professionals now need to be lifelong learners and engage in "more than just education and training beyond formal schooling" (The World Bank, n.d.). In our planned lifelong learning framework, online discussion has the potential to increase learning by allowing students to interact more intimately and to engage in activity which encourages closeness (McDonald, Noakes, Stuckey & Nyrop, 2005).

We worked collaboratively with staff from the Educational Development Centre to create a learning environment that facilitates student-centred learning, provides flexibility for students, and develops students' capabilities with new technologies and multiliteracies. The new course delivery model blends that which is best done face-to-face, such as intensive and interactive workshops and group presentations, with that which is best done online, such as reflective discourse and subject content to create a more effective learning experience for students.

Universities that have been implementing online learning for many years reported that, compared to traditional face-to-face or totally online courses, blended courses that combine on-campus and online learning are the most successful in retaining students and increasing student successes (Dziuban, Hartman & Moskal, 2004). The benefits of a blended mode of course delivery are that students have the flexibility to access learning in their own time while also being part of the wider learning community. The DEST report into first year students' university experience concluded that "maintaining a campus presence is conducive to enhancing students' engagement with the learning community" (Krause, Hartley & McInnis, 2005). Similarly, Rovai and Jordan (2004) found that a hybrid course generates stronger feelings of community than a totally online course and provides more opportunities for all students to participate in discussions than a traditional classroom where a few vocal students may dominate discussion.

Our new blended delivery model of intensive and interactive workshops with supported online activities is being introduced in stages, with the evaluation of the pilot program in 2006 being used to inform further development. The aim is to embed a combination of online and face-to-face delivery in both the Bachelor of Early Childhood Studies and the Master of Teaching (Early Childhood) so that change is at a whole course rather than just a subject level. Analysis of successful programs suggests that they involve the development of a whole course approach where there is a "collective commitment" of all staff to ongoing evaluation and quality improvement and regular assessment of the "capabilities provided by information technology" (Twigg, 2003). The potentials of technology are being used to reconceptualise aspects of course design and delivery such as assessment and professional experience. We have begun to explore the use of "technology-rich" interdisciplinary assignments, such as multimedia presentations and e-portfolios that draw together the learning from a number of units

Rather than being deliverers of information, we see academics as designers of learning environments that facilitate critical thinking. On campus sessions are supplemented with electronic learning resources. These resources include content information as well as experiences such as simulations and case studies that encourage inquiry, critical thinking and both independent and collaborative learning. Text-based internet asynchronous discussion is used to encourage reflection on issues and critical discourse as well as connectivity and collaborative learning as outlined by Garrison, Kanuka & Hawes (2002). In addition, shared on-line resources and data, dynamic work with concepts, as well as the development of collaborative learning communities is used to support learner-centred interactive learning as recommended by Ramaley and Zia (2005).

In 2006 we planned on-campus sessions to maximise benefits for students, with sessions held at key times such as prior to and at the beginning of semester and when assessments are due. We ran an intensive on-campus commencement week, which integrated specific technology skill acquisition with unit content to ensure all students had basic skills and experience in the use of online study methods. These methods included retrieval of information from library e-catalogues, accessing WebCT sites and participation in shared threaded online discussions related to key unit content questions. Technology workshops and academic literacy support were also embedded throughout the course to assist students in the development of digital literacies and academic discourse. This included workshops on academic literacies that were integrated into on-campus sessions and online materials that supported academic and technological skills. We also initiated the forming of student support networks as a strategy to promote collaborative learning in both face-to-face and online learning environments.

Students are regularly asked for feedback about their experiences of blended learning. Students' comments have been positive and at times confronting. Students appreciated the flexibility that online learning provided, with comments such as "being able to complete online work at any hour was really helpful to my study organisation and management". Some students questioned the staff monitoring and assessment of student engagement with online learning experiences and discussions, with some students wanting more weighting attached to this component while others were more focused on monitoring their own learning. One student raised the following question: "Are the learning activities for our own benefit or do we need to show we have done the work?". Students also provided advice to staff where they identified areas they believed could be improved. This included the need for more preparation to work online. Some students suggested that "We need more WebCT workshops and more input about manners and how discussions operate".

While the learning curve for both students and staff has been steep, we now feel justified that our decision for change has been an ethical one. Our flexible and blended heutagogy, using ICTs for lifelong learning, places the learner at the centre of the learning process engaging both learners and teachers in real and deep partnership within communities of practice (Ashton & Newman, in press). Coughlan (2004) believes that collaborative knowledge creating, effected in this manner, is a deeply empowering process for all. We have implemented an ethic of care in our change process decisions and feel ethically comfortable that we have made the correct decision. We will continue to expand the number of units offered in blended mode so that both the one year Bachelor of Early Childhood Studies for the Diploma graduates and the eighteen-month Master of Teaching (Early Childhood) are both available in blended mode.

References

Ashton, J., & Newman, L. (In press). An unfinished symphony: 21st century teacher education using knowledge creating heutagogies. *British Journal of Educational Technology*.

Aston, J., & Elliott, R. (2005). *Living to study or studying to live: The changing structure and priorities of students' lives.* Paper presented at the European Early Childhood Educational Research Association Conference. Dublin, August 30th – September 2nd.

Australian Bureau of Statistics. (2001). *Socio-economic index for areas.* Canberra: Commonwealth of Australia.

Australian Bureau of Statistics. (2005). *Yearbook Australia*. Canberra: Commonwealth of Australia.

Brown, M. (2005). Learning spaces. In D. Oblinger & J. Oblilnger (Eds), *Educating the net generation*, http://www.educause.edu/books/educatingthenetgen/5989 [viewed 1 Sep 2005].

Collis, B., & Moonen, J. (2001). *Flexible learning in a digital world: Experiences and expectations.* London: Kogan Page.

Coughlan, J. (2004). *Creating the Collaborative Organisation: The Promise of Relationship Management.* Hawaii International Conference on System Sciences, (HICSS).

Dziuban, C., Hartman, J. & Moskal, P. (2004). *Blended Learning*, http://www.educause.edu/LibraryDetailPage/666?ID=ERB0407 [viewed 10 Sep 2005].

Garrison, D. R., Kanuka, H., & Hawes, D. (2002). Blended learning in a research university. *Learning Commons: Communities of Inquiry*, University of Calgary, http://commons.ucalgary.ca/documents/BlendedLearning_1.pdf [viewed 22 Sep 2005].

Krause, K., Hartley, R. & McInnis, C. (2005). *The first year experience in Australian universities: Findings from a decade of national studies*. Canberra: Department of Education, Science and Training.

McDonald, B., Stuckey, B., Noakes, N., & Nyrop, S. (2005). *Breaking down learner isolation: How social network analysis informs design and facilitation for online learning*. Paper presented at the Annual Meeting of AERA, Montreal.

Oblinger, D., & Oblinger, J. (Eds). (2005). *Educating the net generation.* http://www.educause.edu/ir/library/pdf/pub7101a.pdf [viewed 6 May 2006].

Ramaley, J., & Zia, L. (2005). The real versus the possible: Closing the gaps in engagement and learning. In D. Oblinger & J. Oblilnger (Eds), *Educating the net generation*. Educause. http://www.educause.edu/books/educatingthenetgen/5989 [viewed 1 Sep 2005].

Rovai, A., & Jordan, H. (2004). Blended learning and sense of community: A comparative analysis with traditional and fully online graduate courses. *International Review of Research in Open and Distance Learning*, 5(2).

The World Bank, (n.d.). *Lifelong learning in the global knowledge economy*, http://www1.worldbank.org/education/lifelong_learning/conceptual_framework.asp [viewed 23 Jul 2006].

Twigg, C. (2003). Improving learning and reducing costs: New models for on-line learning. Educause, http://www.educause.edu/ir/library/pdf/erm0352.pdf [viewed 1 Sep 2006].

University of Western Sydney (2003). *Greater Western Sydney Regional Profile*. University of Western Sydney.

Western Sydney Regional Organisation of Councils, (2002*). Western Sydney Social Profile.* Penrith: Urban Frontiers Program, University of Western Sydney.

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Audience response systems in practice: Improving Hong Kong students' understanding of decision support systems

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There will almost always be a number of students who are reluctant to actively contribute in face-to-face learning situations because they are shy or are culturally concerned about potential loss of face. Audience Response Systems (ARS) are part of a technology that, principally through its feature of anonymity, offers the opportunity for all students to safely contribute in face-to-face learning situations via individual keypads. Greater feedback from a group of learners poses benefits for both learner and teacher. For the teacher it can help identify areas where student understanding may be weak or incorrect and thus allow appropriate feedback to be applied. For the learner it allows them to see how fellow students are coping and to gauge their own relative performance. This paper reports on the use of an ARS with a group of students in Hong Kong studying a second year undergraduate decision support course. The ARS was used to provide process support for a revision session that explored decision support systems (DSS) and decision making and also to gather some details about the students as a population of learners.

Keywords: electronic meeting systems (EMS), audience response systems (ARS), decision support systems (DSS), Hong Kong, culture, teaching and learning strategies

Introduction

This paper explores the use of an Audience Response System (ARS) with a group of students in Hong Kong studying a second year, second semester undergraduate decision support course. The ARS was used to provide process support for a revision session that explored decision support systems and decision making and also to gather some details about the students as a population of learners. Not all the questions posed during the session or data collected are reported here. The first part of this paper provides a brief background to ARS, the student cohort and the rationale for using an ARS in this session. The second part of the paper outlines the use of the ARS in practice. The paper concludes with a discussion of relevant issues and reports the student reaction to the session.

Audience response systems

An audience response system is a collection of hardware and software that enables members of an audience to provide responses to situations that are generated by a facilitator. Data is presented to the audience via a public screen and members of the audience express individual responses through a numeric keypad, the collected data being aggregated by the software and fed back to the public screen as part of a learning cycle. Roschelle, Abrahamson and Penuel (2004) suggest that the use of these systems impacts positively upon the classroom environment in such a way as to make learning processes more student-centered, knowledge-centered, assessment-centered and community-centered. In situations where a group of participants may suffer from anxiety in engagement with open dialogue these systems provide an opportunity for interactivity but within an environment of reduced threat to each participant. (Groves, Gear, Jones, Connolly and Read, 2006)

In practical terms these systems typically make use of PowerPoint as the 'container' and questions can be quickly assembled using a variety of slide templates from an extra toolbar in PowerPoint. Standard, non-ARS, slides can also be interlaced to provide an overall session comprising a mixture of standard presentational slides and interactive slides. Interactive slides can be kept open by the facilitator, allowing students to enter and change data at any time until it is declared that final inputs are required, or various countdown timers can be displayed to limit the time available for responses.

Course details

In this course (subject) students explore the relationship between different types of problems and decisions, the characteristics of different types of decisions makers, individual and group decision making, different approaches to decision-making and two decision support systems (DSS) that support different types of problems and decisions, different types of decision maker and different approaches to decision-making.

The first decision support system the students explore is the spreadsheet DSS. They analyse a complex problem, analyse the decision makers described in a case and develop a small DSS using Microsoft Excel. They are required to scope the problem and plan and manage the project as part of a group. They are also required to learn the software, and ultimately choose the appropriate features that allow them to build a user-friendly application (Banks and Monday 2002, Monday 2001, 2002). The second DSS they explore are two types of Electronic Meeting Systems (EMS), namely keyboard-based EMS and keypad-based EMS. Keypad-based EMS are also known as Audience Response Systems (ARS). In this instance students are introduced to the theory and practice of EMS but until this specific session they have not experienced the hardware and software in a practical situation.

The course has a value of 4.5 units and is one of 24 x 4.5 unit courses undertaken by students to complete the degree program. It has been running annually since 1999 and has been managed, reviewed and revised by the second author throughout this period (Monday 2001, 2002; Monday & Banks, 2004). It is taken by both onshore students (internal and external study modes) and offshore students in Hong Kong (HK). This paper explores the use of an ARS with offshore students who study in their own country. Semesters are 14 weeks long, with 13 weeks of tuition followed by a one-week self-study period before examinations commence. Lecturers visit HK for one week at the beginning of the semester and one at the end to deliver mass lectures of 20 hours in total (4 evenings x 2.5 hour lectures each visit). Between these visits students attend 4 x fortnightly workshops with local tutors who support the software development only. All students can access lecturers via email, telephone and a web-based learning management system throughout the course. The course is scheduled in year 2, semester 2 of the degree program and has pre-requisites of a first year IT course and a second year first semester course in end-user development of databases.

Problems encountered

Limited understanding of the use of EMS and ARS

One area of weakness that still caused concern was in the students' understanding of the use of EMS and ARS. They were unable to understand how an EMS or ARS would work in practice to support decision making. They were also unable to appreciate that a DSS is a support tool under the control of the decision makers rather than an attempt to provide a software solution to the problem (Keen and Scott Morton, 1978). Thus they saw the tool as a decision-making system rather than as a 'information system whose primary purpose is to provide knowledge workers with information on which to base informed decisions' (Mallach 1994). Young (1989) regards these systems as '[I]ntended to interact with and enhance the special mental capabilities of the user, thereby facilitating learning, creativity …' Although the students had always had access to one of the common business software applications (Excel) explored in the course and had demonstrated a reasonable and often good understanding of this software, it had never been possible to provide them with access to any form of commercial EMS or ARS.

Language

Students also, in the past, showed problems with the English language requirements of the program. At an informal meeting with a number of students who had recently completed the degree program the students explained that when they started the degree program they estimated they understood 30 per cent of the required English. By the time they had finished the degree they estimated they understood 70 per cent of the required English. For this course they particularly commented on their difficulty with the language used in the set text originally used, but not the lectures. In order to help students to understand the topics more fully the lecturers have since written a textbook (Monday and Banks, 2004) to accommodate the needs of these students. It must be emphasised that the students are still required to explore the same concepts to the same depth of understanding. The major difference is in the length and complexity of the sentence structures. The response to the new textbook, now in its 3rd edition and updated in response to student feedback, has been very positive and students started to demonstrate a much clearer understanding of the course content.

Group size and interaction

The smallest group size in Hong Kong has been 84 students (the cohort discussed in this paper). Previous group sizes have been at least 120 students and quite often as large as 320 students. All classes are held in large lecture theatres. This large group size has not encouraged students to speak up in class when questions have been posed to them. However, on occasion, when large numbers of students had dispersed at the end of a session, leaving just ten to 20 students who remained to ask questions of the lecturer, the level of willingness to ask questions and engage in dialogue was considerably higher. The approach previously adopted in the lecture theatre had been for students to be given a question which they could answer either individually or in small groups. The lecturer circulated amongst the students checking the answers prepared by the students, providing further direction as necessary until the students had demonstrated a good understanding. Affirmation of their correct answer had then encouraged students to verbalise their answer in the large group. However, given the numbers and the time available it was not possible to work with all students individually or in their small groups.

The ARS in practice – findings and discussion

To explore the problems detailed above the first author, who has considerable experience in using ARS in a variety of educational and commercial settings for over thirteen years, mainly with small groups (Banks, 2001, 2003, 2006), offered to run an ARS session in HK. The system used to support this session was a 40-keypad infra-red system provided by KEEpad and used TurningPoint software.

Ideally we would also want to provide students access to a text entry EMS as well as the numeric ARS but there are practical problems that prevent this. For example, EMS are complex. Set-up time at a temporary location can be considerable and typically they are restricted to a small number of users (i.e. 16) in practice. We are considering the production of a scenario-based video to overcome these problems.

Limited understanding of the use of EMS and ARS

The system was used on the second evening of the second visit. The theory of EMS and ARS had been introduced to the students on the first evening of this visit. The main purpose of the session was to provide students with practical exposure to a technology they have little previous experience of and have difficulty picturing and understanding. In phase 1 of the session the ARS was used to capture some data that would help us to better appreciate this specific student population. In phase 2 the ARS was used to support their revision.

Phase 1: Exploring the student population

Eighty-four students were enrolled on this course and of these 68 attended the ARS-based session. During the session the ARS was used to ask a range of questions but only a limited number of responses are presented in this paper. Students were firstly put into pairs and each pair was issued with a keypad. The first member of each pair was asked eleven general questions. The keypads were then handed over to the second member of the pair and the same questions were asked again. This approach was adopted simply because we had access to only 40 keypads at that time so it was not possible to provide one keypad for each of the students who attended the session. Once the data was collected from each student the two sets of data were aggregated. The ARS allows the export of all collected data into a standard Excel spreadsheet for this purpose. This initial data-capture process helped to familiarise the students with the technology and to provide some demographic data.

The first set of questions asked students for their age group, gender, what is most important in their life, difficulties they encounter when studying this degree program, the largest grouping in which they feel comfortable making verbal contributions in class, and whether they tend to leave assignment work until the last minute. The aggregated responses for the basic demographic questions are shown in Table 1.

Table 1: Student demographic profile

Indicator	Count	%
Age profile of students		
Under 21	6	9
21–25	14	21
31–35	17	26
36–40	7	11
40+	0	0
Gender		
Male	5	7
Female	63	93
Most important in my life		
Family	53	78
Work	7	10
Sport/leisure	7	10
Education	1	2
Total	**68**	**100**

This confirmed that age and gender profiles, as detailed in Table 1, are typical for the students on this program since its conception. Students from this program had been asked only once before to rank, using pen and paper, what was most important in their life. The results of this earlier cohort mirrored the results shown here for this cohort.

We were interested in gaining some understanding of the difficulties facing the students studying on this degree program. On the evening prior to this ARS session, students were asked to write down what they considered to be their single greatest difficulty in studying this degree program. Fifty-three students submitted an answer and the list generated by the students is shown in column one of Table 2. These were then collected, collated and entered into the ARS ready for the ARS session the following day. The data had to be split into two lists because the infra-red keypads being used provided only 10 choices. In some circumstances the need to split a list can be problematic (Banks and Bateman 2004) and in this instance it has to be recognised that the drawing of the boundary by the authors may have distorted the students' final choice. Many other wireless-based ARS do provide multiple digit entry. The first list represented issues we considered to be more general to their life style whilst the second list was more study focused. The results from the subsequent ARS responses are also shown in Table 2 below. Although the paper-based list presented the two most popular reasons as difficulty in balancing study, work, home and leisure (19 students) and insufficient time to study (13 students) the electronic session indicated a different pattern.

Table 2: Difficulties encountered in studying degree program

	ARS Responses	
My single greatest difficulty in studying this degree program is:	**Count**	**%**
Difficulty in balancing study, work, home and leisure	17	30
Stress to pass course/exam	16	29
The cost of the course	6	11
Insufficient time to study	6	11
Not enough time to gather and analyse data and information for assignments	4	7
Achieving a good or HD assignment	3	5
Difficulty identifying efficient way to study	3	5
Maintaining good group relationships	1	2
English language and communication skills	0	0
Total	**56**	**100**
Another difficulty in studying this degree program is:		
Limited time to understand the subject	26	44
Assignment scheduling causes problems	17	29
Too many assignments	6	10
Not enough lectures and tutorials	5	8.5
Not enough feedback in assignments	5	8.5
Total	**59**	**100**

Language

Of particular interest was that the students did not consider English Language and communication skills to be problematic. This proved to be contrary to informal evidence as mentioned earlier and in part may be accounted for because the authors had introduced a textbook written specifically for this group of students. Although the list of issues had been created by the students on the first evening, in the electronic poll conducted the following evening it did not rank as important. It may be that this was perceived to be less of a problem relative to the other problems they faced and had not occurred to them on the previous evening. It may have been that the students who raised this issue on the first evening were not present on the second evening. Given that anonymity had been guaranteed to encourage participation only speculation is possible. The highest rated item - difficulty in balancing study, work, home and leisure – was reflected in another question that asked students to indicate their agreement with the statement 'I leave my assignment work until the last minute'. Sixty eight per cent confirmed that they do leave their assignment work until the last minute. This comment may be explained by the priorities that students allocate to the various activities in their life (see Table 1).

Group size and interaction

The results from this poll, as shown in Figure 1, supported our observations concerning the group size and interaction difficulties identified earlier. This clearly demonstrates that students are uncomfortable making verbal contributions in large groups. Groves et al (2006) suggest that in an open forum self preservation may take precedence over the task at hand if a participant fears that they may be undermined as an individual. It will be seen later that the students' responses to the anonymity afforded by the ARS were very positive.

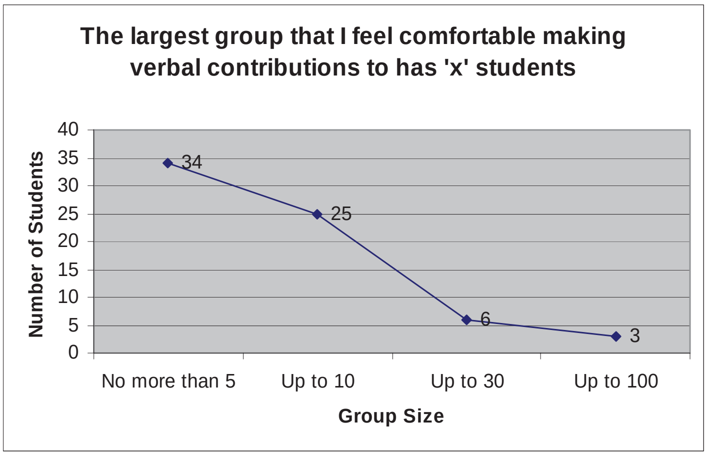

Figure 1: Group size and interaction

Phase 2: Supporting the students' revision

For the remainder of the session the students worked in pairs with one keypad shared by two students who discussed each question between them before indicating their response with the keypad. This approach is identified by Mazur (1997) as Peer Discussion and encourages students to discuss their answers before offering a response.

The first question asked the students to indicate what type of system we were using to support the session, the possible responses being GDSS, ARS or EMS. The responses are shown below in Table 3, with ARS being the correct response in this context, although GDSS as a generic label would also be a reasonable response.

Table 3: Type of system in use – first and second poll

	First poll		**Second poll**	
The type of system we are using now is an:	**Count**	**%**	**Count**	**%**
GDSS	0	0	0	0
ARS	***31***	***91***	***33***	***97***
EMS	3	9	1	3

Note. In this and subsequent tables in the paper showing the student responses we have italicised the 'correct' answer.

As can be seen, three pairs of students (9%) provided an incorrect answer to this question. We were interested to explore the findings of d'Inverno, Davis and White (2003) who reported that typically around 40% of their students failed to identify the correct answer to simple questions. Interestingly they found that if the same question is asked again around 20% still provide the wrong answer. (They do, however, suggest that there may be some deliberate entry of incorrect answers as not all students feel that the technology offers them benefit.) To explore this finding we discussed the differences between the various systems and then asked the question again. Examination of the keypad response data (Table 3, second poll) indicated that one pair of students who answered 'EMS' the first time the question was answered still believed the answer to be 'EMS' even after some class discussion. It is possible, using this system, to correlate the answers from a particular keypad. Had we had more time in the session it would have been useful to explore the reasons that this pair had for steadfastly maintaining their view. This effect requires further research and supports the belief that an ARS can provide some interesting insights into what is happening in the class.

Another question was asked twice and the results are documented in Table 4. The question asked which box in the diagram related to laissez-faire management. This showed a greater variation in responses.

After some discussion about the various management styles in the context of the diagram the results indicate a greater consensus.

Table 4: Management style – first and second poll

	First poll		Second poll	
Which box represents laissez-faire?	**Count**	**%**	**Count**	**%**
A	3	9	0	0
B	2	6	0	0
C	7	21	3	9
D	***22***	***65***	***30***	***91***

Some questions posed no difficulties at all for the students, as can be seen in the responses presented in Table 5:

Table 5: Time and place dimensions

ARS technology normally supports meetings that are:	Count	%
Same time, same place	***34***	***100***
Same time, different places	0	0
Different time, same place	0	0
Different time, different place	0	0

Other questions produced broad spreads in responses as indicated in Table 6:

Table 6: Number of participants

What is the maximum number of participants that an ARS can support in a single meeting?	Count	%
Sixteen	3	9
Fifty	9	26
Several hundred	11	32
Several thousand	***11***	***32***

The spread of responses suggests that this may have been a useful question to discuss and then re-poll to determine what students were thinking when they were answering the question. Limited time did not allow for this but it has made us consider why this question produced such a broad spread. It is quite possible that the issue here is more to do with the question itself rather than with student understanding, though the question does not appear to be difficult. It could be that we had only just introduced the topic and they had not had time to assimilate the information.

The way that questions were posed indicated some interesting responses that require further investigation. For example the range of responses to a Likert-based question is shown in Table 7;

Table 7: Decision styles –first poll

Someone who uses large amounts of information and alternatives and copes well with ambiguity is classed as being 'Directive'	Count	%
Strongly Agree	1	4
Agree	9	33
Disagree	***8***	***30***
Strongly Disagree	***9***	***33***

The situation here is that 63% disagree or strongly disagree with the proposition. Both of these answers are appropriate. This data was discussed with the students and then they were given a short time to discuss the question and the data in their pairs. The same basic question was then posed using a different response frame and these results are documented in Table 8:

Table 8: Decision styles – a different response frame

Someone who uses large amounts of information and alternatives and copes well with ambiguity is classed as:	Count	%
Directive	0	0
Analytical	***23***	***88***
Conceptual	3	12
Behavioural	0	0

The results in Table 8 show that the majority of students who previously felt that the answer was 'Directive' changed their position following discussion and a rewording of the question. This time 88% of the total student population offered the correct response 'Analytical'. Again, with more time these issues could have been explored with the ARS providing feedback to the students about their changing views. This illustrates the need for careful wording of questions both when the ARS session is developed and during its use.

Use of a generic slide

The previous slides outlined here were all produced to support specific issues but it is possible to use a generic slide around which any issue can be discussed. By repeatedly using the generic slide it was possible to put forward a number of scenarios and ask the students to classify them. The same slide can be re-used as many times as required and then the session moved on to a new scenario once the students demonstrate an understanding of the current scenario. In this case the generic slide was titled 'what kind of problem is this for the case organisation?' and a range of scenarios could be verbalised around this generic slide.

This slide was used to obtain feedback from the students about their perception of a number of problems that related to the case study. A specific issue facing the case organisation was first outlined and then the students asked to decide if the problems would be best classified as Structured, Semi-structured, Unstructured or Wicked. For one case example that was outlined, the student responses, shown in Table 9, were:

Table 9: Problem classification – first and second poll

	First poll		**Second poll**	
What kind of problem is this for the case organisation?	**Count**	**%**	**Count**	**%**
Structured	0	0	0	0
Semi structured	***6***	***67***	***9***	***100***
Unstructured	2	22	0	0
Wicked	1	11	0	0

After some discussion of the distinguishing features of the problem the question was posed again (Table 9, second poll) and the feedback indicated that there was a change in student position.

Conclusion

Observation of this course over a period of time suggested a number of issues of significance. Three of these have been explored in this paper - language difficulties faced by students, their dislike of interaction in large groups and their limited understanding of the use of ARS.

Firstly, our concerns about the language issues were not identified as significant by this group of students. The data from the session did not support the feeling that students had language difficulties. However, this may be explained by the use of a textbook written specifically for this student group.

Secondly, this group of students was reluctant to ask or answer questions in a large public forum. On previous deliveries of the course we had observed that the students were reluctant to ask questions in a large group in open forum. We had also observed that at the end of sessions when most students had left, questions were forthcoming from the remaining small group. Our data from the ARS session strongly suggests a relationship between willingness to ask open forum questions and group size. The anonymity provided by an ARS helps to alleviate this problem.

Thirdly, one specific area of the course, namely EMS/ARS, was unfamiliar to them in both concept and practice. This unfamiliarity with some of the course material combined with a reluctance to ask questions in public, contributed to a lack of understanding. We felt that the anonymity afforded by an ARS would allow us to create a learning environment where the majority of the group would be able to contribute to the learning process. We further felt that providing some hands-on experience of this unfamiliar technology would also prove beneficial to them. Their subsequent performance in the exam questions relating to EMS/ARS appeared to be better than for previous cohorts. It has to be acknowledged that we cannot prove that this is a result of the ARS approach we adopted, but we are sufficiently encouraged to seek to repeat the approach in further deliveries.

The data also provided some useful and unexpected insights into the problems facing this particular community of learners. They are clearly juggling a number of complex and inter-related factors in their lives and perceive study as less significant than family and work. The various family and work pressures acting on them combined with their perception of education leads to last minute work on assignments and probably as exam preparation. Given these problems and the somewhat limited amount of face-to-face contact time available with the overseas lecturers, it would appear to be vital that the learning opportunities are maximised in these contact times.

The ARS may be one tool that can help achieve this goal, by providing anonymity that promotes greater interaction and engagement. As a classroom technology it is easily integrated into the learning environment and was seen by this group of students in a positive light. The majority of the students (90%) felt that this was both a useful and enjoyable experience. Clearly there may well be a novelty factor at work here and this was only a one-off session, but the ARS literature does suggest that positive student response is typically maintained over time. In future sessions we would hope to explore the underlying reasons for these positive responses and particularly to determine if anonymity is indeed a significant benefit for this particular student population. Overall we feel that the session provided benefits for both staff and students and has suggested directions for further work. It is our intention to seek funding for further research is this area.

References

Banks, D.A. (2001). A critical reflection on the value of course evaluation questionnaires: using group support tools to explore student evaluations, *Information Resources Management Association (IRMA) Conference*, Toronto, May

Banks, D.A. (2003). *Using keypad-based group process support systems to facilitate student reflection*, Australian Society for Computers in Learning and Tertiary Education (ascilite) Conference, Adelaide, Dec

Banks, D.A. (2006). Reflections on the Use of ARS with Small Groups, in Banks, D.A.(Ed) *Audience Response Systems in Higher Education: Applications and Cases*, Idea Group Inc., PA

Banks, D.A. & Bateman, S. (2004). *Using an Audience Response System to Support a 'Lost in the Desert' Learning Scenario*, International Conference on Computers in Education (ICCE) Conference, 'Acquiring and Constructing Knowledge Through Human-Computer Interaction: Creating New Visions for the Future of Learning', Melbourne, November

Banks, D.A. & Monday, A. (2002). *Interpretation as a factor in the development of flawed spreadsheets*, European Spreadsheet Risks Interest Group (EuSpRIG) Conference, 'Spreadsheet Roulette: the hidden corporate gamble', Cardiff, UK, July

d'Inverno, R.A., Davis, H.C. & White, S.A., (2003). Student Feedback … A Lesson for the Teacher, *Teaching Mathematics and Its Applications*, 22, 163–169

Groves, S., Gear, T., Jones, C., Connolly, M., and Read, M., (2006). Learning and Anxiety: Exploring Individual Judgement Processes in a Learning Environment with a Group Support System, in Banks, D.A. (Ed) *Audience Response Systems in Higher Education: Applications and Cases*, Idea Group Inc., PA

Keen, P.G.W. & Scott Morton, M.S. (1978). *Decision Support Systems: An Organizational Perspective*, Addison-Wesley, Reading, Massachusetts

Mallach, E.G. (1994). *Understanding Decision Support Systems and Expert Systems*, Irwin, Sydney, Australia

Mazur, E., (1997). *Peer Instruction: A user's manual*, Prentice Hall, Upper Saddle River, NJ

Monday, A. (2001). *The reality of teaching large groups of local and international business students to develop end-user applications*, Information Resources Management Association (IRMA) Conference, Toronto, May

Monday, A. (2002). *A Strategy for Developing End-User Developers: I thought I hated every minute, but I learnt such a lot*, Informing Science and IT Education (InSITE) Conference, Cork, Ireland

Monday, A. & Banks, D.A. (2004). *"Decisions, Decision Makers and Technology Support"*, 3rd edn, Pearson Education, Australia

Roschelle, J., Abrahamson, L. & Penuel, W.R. (2004), *Integrating classroom network technology and learning theory to improve classroom science learning: A literature synthesis*, Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA

Young, L.F. (1989). *Decision Support and Idea Processing Systems*, Wm. C. Brown Publishers, Iowa

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Collaboration for inter-cultural e-learning: A Sino-UK case study

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This paper presents work in progress in a Sino-UK project to develop inter-cultural e-learning through a collaborative team process that is itself inter-cultural. The Universities of Lancaster and Sheffield are working with Beijing Normal University, Beijing Jiaotong University, South China Normal University and Zhejiang Normal University to develop joint understandings of e-learning through the design, production and implementation of an online course. This will be a short, fully virtual course run on Moodle starting in October 2006 that will offer Higher Education teachers in the UK and China a professional development opportunity to understand more about inter-cultural e-learning. In the project the Sino-UK team are working collaboratively in ways that enable pedagogies and practices about e-learning from both China and the UK to be incorporated into the learning design of the online course. This has required us to share pedagogic beliefs, experiences of e-learning and e-tutoring in order to achieve effective decision-making around design and joint course production that draws on the collective expertise and experience of both the UK and Chinese teams. We have found that inter-cultural collaboration requires an understanding of policy, institutional, subject and role cultures as well as pedagogic beliefs. Inter-cultural collaboration has the potential to lead to new e-learning practice, but we are also experiencing considerable impact on our existing practice and challenges to our 'taken-for granted' assumptions about e-learning, professional development enhancement and institutional and national impact.

Keywords: e-learning, learning design, pedagogic beliefs, e-tutor training, inter-cultural collaboration, professional development

Introduction

The paper addresses the themes of cultural differences in e-learning, intercultural collaboration for joint development and understanding of e-learning, inter-cultural decision-making in e-learning and the impact of these factors on the professional development of members of the team. These themes represent the major challenges faced and experienced by the project team in relation to the inter-cultural collaboration processes in the project. A rationale is given for the strategic significance of each of these themes, supported by references to the literature and examples from both the Chinese and the UK context. There is a brief outline of the methodological approach being implemented for researching the project as a case study. The collaborative processes led to practical outcomes in terms of decisions that were made about the design and implementation of the inter-cultural e-learning course and these are briefly presented. Finally some tentative conclusions are presented to assess the significance of the case study as a contribution to an understanding of international collaboration and intercultural practice in e-learning.

Background

This paper presents research that is taking place in a project which is part of the Sino-UK elearning programme (eChina UK - further information at http://www.echina.uk.org) jointly funded by HEFCE in the UK and by institutional funding in China. The project partners are the Universities of Lancaster and Sheffield in the UK and Beijing Normal University, Beijing Jiaotong University, South China Normal University and Zheijiang Normal University in China. One of the goals of the eChina-UK Programme as a whole is to develop understandings in both countries of cultural change and exchange in eLearning pedagogy (Spencer-Oatey, 2006). The aim of this particular work package is the collaborative production of an intercultural, professional development e-learning and teaching course , to be run online and offered to higher education staff in the UK and China which would involve the examination of intercultural (Sino-UK) conceptions of e-learning. In order to achieve this goal, the members of the UK-China team are working collaboratively to design and produce the online course. This has required the implementation of an intercultural collaborative approach to e-learning design – that is, a process that builds on different conceptions and approaches to elearning and leads to decision-making around design, using features and practices from both the UK and Chinese contexts.

The project builds on the e-learning policy priorities of both countries. In China the large numbers of distributed learners in relation to the numbers of teachers has led to a rapid growth in distance learning and the numbers of universities (68) accredited to provide online degrees. In the UK, e-learning is a strategic priority for HEFCE and is also linked to the internationalization of higher education (HEFCE, 2005). Priorities for e-learning include using technology to enhance the learner experience, a focus on quality and standards through benchmarking and a call for more research and evaluation. E-learning is seen as part of globalization to build capacity in 'borderless' education and distance learning, thus improving the competitiveness and marketisation of higher education and impact on international cooperation and student mobility.

At the same time, the Chinese Ministry of Education is introducing curriculum reform about new methodologies related to student-centred learning, group work and teacher-student interaction and this was a strategic driver of the project. Chinese e-learning policy also prioritises quality, standards and widening participation. The Chinese team had considerable experience developing e-learning with educational technology as the subject and instructional system design (ISD) as their pedagogic model, while the UK team the UK's team experience was of developing e-learning as collaborative learning through online groups and communities, with weave of social theories of knowledge construction as the basis of a pedagogic model (Lally et al., 2006). The intercultural collaboration focused on sharing the two approaches to e-learning and exploring whether it was possible to use design features from both models in the design of the online course.

Issues of cultural difference in e-learning

E-Learning is now a global phenomenon that in the West is a strategic element of the marketisation and internationalization of higher education. Its strategic importance and growth is based on the assumption that elearning is 'borderless' According to Middlehurst (2002) "borderless education" removes boundaries/constraints in relation to time, space, distance, student recruitment/mobility, sectoral differences, education and corporate worlds. Many national e-learning policies assume that "borderless education" is unproblematic. However, the global development of e-learning often ignores the issue of cultural difference and a number of writers in the e-learning field have identified this as an issue. Moore, Shattuck and Al-Harthi (2006) for example raise important questions about the complex relationship of e-teaching, learning and culture in global online environments, with examples from American distance learning to show how pedagogies based on Western beliefs might cause conflict with the cultural values of learners from other countries. Ziguras (2001) while acknowledging that "educational imperialism" often occurs within transnational education, observes that the use of ICT has intensified the flow of "knowledge transfer" and therefore the concerns about cultural impacts of ICT. Henderson (1996) in addressing the question of how to develop culturally contextualized e-learning, developed a Multiple Cultural Pedagogic Model of interactive multimedia design that was based on the 14 dimensions of interactive learning of Reeves (1992). The 14 dimensions of interactive learning used by Reeves encapsulated many of the issues related to pedagogic beliefs in e-learning that have emerged in the eChina-UK collaboration, for example "Pedagogical Philosophy (Instructivism vs Constructivist), Goal Orientation (Sharply focused vs Unfocused), Role of Instructor (Teacher Proof vs Equalitarian Facilitator)" (Reeves, 1992). Collis (1999) identified the need to operationalize the accommodation of cultural difference into the design of e-learning by providing some design guidelines for flexibility that respond to multiple cultures. However, these guidelines related to on-campus blended learning contexts in one university. In our eChina-UK project, we are attempting to build on e-learning pedagogic features from two different educational cultures – the UK and China – to design an online course through intercultural collaboration that will attract higher education teachers from both countries.

The action research process

One of the aims of the project is collaborative research and we have implemented a research process in the project to enable members of the project to carry out action research in relation to their own professional interests and also stimulate and achieve joint publication. For example, my own research questions relate particularly to intercultural pedagogy in e-learning – what critical theories and pedagogies influence the design and implementation of successful intercultural e-learning; how do e-tutors facilitate intercultural e-learning; can intercultural e-learning achieve aspects of social translation that go beyond education, for example impact on policy and professionalism? The action research will enable the use of three qualitative approaches to methodology: case study, ethnography and grounded theory. The research methods being used include interviews with participants, participant-observation, analysis of project and policy documents, online discourse analysis and use of reflective journals.

The experience of intercultural collaboration

Effective intercultural collaboration is essential to the success of intercultural projects such as this, but intercultural collaboration is complex. The feature of complexity in this project is the culturally different educational practices of the partners who must come together to work as a team to make decisions in relation to course production that lead to high quality e-learning. However, good collaboration rarely happens by accident, and as Maznevski (1994) points, cultural diversity can pose barriers to effective interaction. Our aim in this intercultural collaboration has been to attempt to implement a process through which we are able to understand each other, share the pedagogic ideas and expertise in e-learning of the partners, and build on these to develop new ideas that might lead to new ideas about e-learning and/or transfer of knowledge. Integrating pedagogic ideas to implement in the design of e-learning means more than identifying underpinning theories that inform particular learning and teaching practices. According to Goodyear (2001) it involves bringing together pedagogic ideas with methods, tools and processes for facilitating learning and linked closely to the design of learning tasks and activities and the functionalities of the technologies being used. It also encompasses the existing context of learning and integration with existing learning and teaching practices that will inevitably be adapted and changed through its impact. In an intercultural project, the processes of communication and collaboration must be strong enough for this to happen and our experience suggests that these processes should be planned and facilitated.

Communication and language issues

Project meetings are conducted in both English and Chinese, with both project teams having a bilingual capacity. Many members of the Chinese team are English teachers, so there is obviously the motivation to practice speaking in English. The online course will be taught in English, as that is the language of the internet.

We have set up protocols to support communication within the project outside of project meetings. These include use of Skype telephony, discussion forums in Moodle, e-mails, video-conferencing, progress reports and exchange of resources.

However, we still find it essential to have face-to-face meetings where members of the team can get to know each other As our respective beliefs of e-learning are the focus of project meetings, ideas and understandings of e-learning terminologies, issues and practices are constantly discussed, revisited and renegotiated through the process of developing and producing e-learning materials. We reach agreement on the meaning of terminologies but constantly have to revisit our understandings, and as a consequence have to rework ideas and materials in the light of new understandings.

Pedagogic issues

There were contrasting views on e-learning pedagogy between the UK and the Chinese teams.

The professional e-learning experience of the UK team was of fully virtual teaching through a virtual learning environment, practising networked learning as defined by Goodyear (2002):

> Networked learning is learning in which communications and information technology (C&IT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources (Goodyear, 2002).

A key aspect of the UK's theoretical approach to e-learning is a social-constructivist view of learning that also considers the situativity of learning processes. A key feature for us of e-learning design is the major significance of online discussions where participants link new knowledge to their prior knowledge and actively construct new internal representations of the ideas being presented (Boekaerts & Simons, 1995). We also believe that group learning is very important, drawing on the work of Vygotsky (1962, 1978) and Lave and Wenger (1991) and that learning is a process of participating in cultural practices, a process that structures and shapes cognitive activity (Lave & Wenger, 1991). Consequently in our design approach to e-learning we put more emphasis on the learning community and dialogic processes and less on the production of learning materials and pre-defined learning outcomes. In our model the teachers are also the course developers.

The Chinese approach to e-learning has been strongly influenced by instructional systems design that supports learning as the acquisition of propositional knowledge. The Chinese team had a considered approach to e-learning based on an organizational framework for a web-based curriculum with defined activities developed by Huang and Zhou (2005). This tends to lead to a production model as defined by Cao, Wang, & Tang (2005):

> A key textbook is used as the source of content for each course. This is 'reappropriated' for the online learning setting; instructional designers prepare the content of the book for presentation online. Tutors who have not been involved in the development of the course content or in the learning and teaching processes to be pursued in the course are recruited to teach the learning material. Students are expected to focus on 'learning' the content, largely on their own (Cao et al., 2005).

In the Chinese model, the production of e-learning is separated from the learning and teaching process and there is little online communication and group work. On the other hand, the online class size in China is about 10 times larger than in the UK so there is an issue of scalability and practicality and whether the UK model of an online learning community would be successful in China. The Chinese team also had an interest in problem-based learning as providing an authentic context for learning that motivates the learner, and this helped to provide a 'bridge' between two pedagogies – collaborative e-learning and problem-based learning that could both be incorporated into the learning design. Many experts, for example Weller (2002), believe that it is possible to mix pedagogic models into one design, but we will have to wait and see whether our learning design is successful.

Intercultural decision-making about e-learning design

How can an e-learning design be intercultural?

It was agreed that the theoretical model for the development of the online course would be the learning community model with some elements of problem-based learning, but with design features adapted from the Chinese context and use of resources from both a Chinese and a UK context. Some of the materials are bi-lingual and in addition the e-tutoring team comprises e-tutors from both the UK and China. English language support will be provided for Chinese learners and the Chinese e-tutors will themselves also be supported and mentored. Written resources will have summary annotations for Chinese learners, and the e-tutoring team will mediate any language/communication issues through integral learner support. Though the collaboration, the online course has now been designed and is in the process of being completed for October. It is a short course involving about 50 hours of study over 10 weeks. The design of the course is evidence of how the collaboration has enabled the two teams to move from their theoretical background to make decisions about an adapted design of an online course that could be implemented in a higher education context both in the UK and in China. It has the following features:

- Online learning community/group work/group problem-based learning;
- 3 phases, each with specific purpose and learning outcomes;
- A minimum of 3 activities for each phase;
- Online resources linked to key topics, including readings, audio files, powerpoints, video clips;
- Moodle is being customised and tools embedded as online course is developed;

- Design of course is determining roles and competences of e-tutors;
- Assessment through e-portfolio, to receive Certificate of Completion.

Table 1: Outline of online course (using Moodle – open source virtual learning environment)

Phase	Purpose	Activity	Resources/tools
Induction	Preparation for online learning	Practice online discussion in Moodle Activity feedback Roles of participants and e-tutors	Induction reader Audio file Discussion forum e-portfolio tool Skype internet telephony
Unit 1	Becoming a learning community	Introductions & goals Thinking about being a learning community	Introductions template Discussion on key reading Use e-portfolio tool Summary
Unit 2	Conceptions of e-learning Sharing conceptions Producing group conceptions	Group problem-based learning Working in pairs and sharing Produce group report	Construction of conceptions template e-portfolio tool Sample readings/case studies Summary Questions template Resources for topics Group template Summary
Unit 3	Reflections & closing	Present learning products & feedback Sharing group products Evaluate experience & complete template Submit portfolio Accreditation	Evaluation template e-portfolio tool Summary

E-tutor training

The intercultural design has implications for the role of the e-tutor, the person who is responsible for facilitating the collaborative activities of the learners as they engage in the learning activities presented above. This insight revealed a gap in the provision of effective e-tutor training, both in China and the UK, particularly in enabling teachers to manage the change from teaching face-to-face to teaching online and that develops pedagogic as well as technological expertise. The e-tutor training has therefore been developed and embedded in the project collaboration, as the e-tutors from China and the UK have been directly involved in the design task of building the online course. This started at a face-to-face project meeting and has continued online in Moodle, including the building of resources. The e-tutors have participated in research interviews reflecting on their professional development for e-tutoring. These interviews have revealed that e-tutor training as professional development opportunity is a new concept in China. In the final face-to-face session of e-tutor training over two days there will be 3 elements: (i) induction into Moodle; (ii) induction into course content and structure; and (iii) induction into e-teaching strategy comprising team approach to e-tutoring, tutor-led and tutor-facilitated online discussion, handling problems, online learner support and e-tutor support. During the online course there will be an e-tutor forum, including language support, an e-tutor code of practice and co-mentoring of e-tutors. After the course the e-tutors will participate in evaluation of the course and further post-course interviews. We believe this process is essential to achieve the professional development potential of the e-tutors. As a result of running the online course, we are expecting to gain considerable insight about intercultural issues relating to international collaboration, e-tutor training and intercultural online learning.

Conclusion

This paper is presented a case study on the experience of developing intercultural collaboration in a Sino-UK context and gives some indication of the collaborative process that has enabled the e-learning teams from the UK and China to move towards a more intercultural, shared understanding of pedagogy in which learning designs are developed and implemented that are built on the knowledge and expertise of both teams. We have learned that intercultural collaboration on e-learning is demanding and time-consuming but is ultimately worthwhile, because new knowledge, creativity, insights and practices can be developed. However, critical shared reflection on beliefs and practices of e-learning is an essential requirement to maintain the process of effective intercultural collaboration.

References

Banks, S., Lally, V., & McConnell, D. (Eds), (2003). *Collaborative e-learning in higher education: Issues and strategies.* University of Sheffield: SPIE publication.
Cao, W., Wang, T., & Tang, J. (2005). Tertiary-level web-based English language education in China: Tensions and implications, *Sino-UK eLearning Workshop.* Beijing, China.
Collis, B. (1999). Designing for difference: Cultural issues in the design of www-based course support sites. *British Journal of Educational Technology*, 30(3), 201-215.
Goodyear, P. (2001). *Effective networked learning in higher education: Notes & guidelines.* http://csalt.lancs.ac.uk [viewed 21 Jul 2006].
HEFCE, (2005). *UK elearning strategy,* http://www.heacademy.ac.uk/e-learningimplementation.htm [viewed 20 Oct 2006].
Henderson, L. (1996). Instructional design of interactive multimedia: A cultural critique. *Education Technology Research and Development,* 44(4), 85-104.
Huang, R., & Zhou, Y. (2005). Designing blended learning focused on knowledge category and learning activities. *Case studies from Beijing Normal University.*
Lally, V., McConnell, D., & Banks, S. (2006). Developing a collaborative approach to elearning design in an intercultural (Sino-UK) context. In H. Spencer-Oatey (Ed.), *elearning in China: eChina perspectives on policy, pedagogy and innovation*. Education in China, Reform and diversity series: Hong Kong University Press.
Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge: Cambridge University Press.
Lewis, D., & Allan, B. (2005). *Virtual learning communities: A guide for practitioners.* Society for Research into Higher Education & Open University Press, Maidenhead.
Maznevski, M. L. (1994). Understanding our differences: Performance in decision-making groups with diverse members. *Human Relations*, 47(5), 531-552.
McConnell, D. (2006). *Elearning groups and communities.* SRHE/Open University Press, Maidenhead.
Moore, M. G., Shattuck, K. & Al-Harthi, A. (2006) Cultures meeting cultures in online distance education. *Journal of e-Learning and Knowledge Society, The Italian e-Learning Association Journal,* 2(1).
Reeves, T. (1992). Effective dimensions of interactive learning systems. *Proceedings of the Information Technology for Training and Education Conference (ITTE '92)* University of Queensland, Brisbane.
Spencer-Oatey, H. (Ed.), (2006). *Elearning in China: eChina perspectives on policy, pedagogy and innovation.* Education in China: Reform and diversity series, Hong Kong University Press.
Goodyear, P. (2002). *Psychological foundations for networked learning.* In C. Steeples, & C. Jones, (Eds), *Networked learning: Perspectives and issues, (*p. 56). London: Springer-Verlag.
Vygotsky, L. S. (1962). *Thought and language* (E. H. A. G. Vakar, Trans.). Cambridge, MA: MIT Press.
Weller, M. (2002). *Delivering learning on the net: The why, what & how of online education.* Open and distance learning series: Kogan Page.
Ziguras, C. (2001). Educational technology in transnational higher education in South East Asia: The cultural politics of flexible learning. *Educational Technology & Society*, 4(4), 8-18.

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Bionotes

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Collaborative learning: Some possibilities and limitations for students and teachers

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Collaborative learning has become recognised as a means of encouraging deep learning and a key technique in problem and experienced based learning. For Computing students collaboration is not only a learning strategy but a learning outcome. While this is not a new idea, there appears to be reluctance on the part of teachers and students to create and take those opportunities. This paper seeks to revisit the possibilities that exist for collaboration ranging from team based work to peer review in the hope of motivating a change in culture and practice. We include discussion of these strategies together with highlights from student surveys regarding student dispositions towards collaborative learning. We note that the perceived overheads and logistical difficulties, to students and teachers, will often discourage the use of collaborative tasks, but that the educational outcomes achievable through collaborative learning exceed those possible when students work in isolation. Particular attention is given to technological approaches for facilitating collaborative learning. While the discussions that follow relate to computer science education specifically, it is intended that many of the approaches and associated issues will apply to other learning domains.

Keywords: collaborative learning, groupwork, team-based learning, computing, computer supported collaborate learning

Introduction

Collaborative learning is increasingly being recognised as a technique for improving learning outcomes (Beck, Chizhik, & McElroy, 2005; Chase & Okie, 2000; Hűbscher-Younger & Narayanan, 2003; Jonassen, Lee, Yang, & Laffey, 2005; Joseph & Payne, 2003; McDowell, Werner, Bullock, & Fernald, 2002). Based on socio-cultural learning principles (Vygotsky, 1978), collaborative learning allows students to progress beyond what they would have been able to learn alone by sharing mental models and observing the thought processes of others. As opposed to direct instruction, collaboration allows students to actively participate in problem solving processes by communicating about the conceptual representations relating to the task at hand. Collaborative approaches allow the tightly-coupled interactions required for rapid and complex concept formation to occur (Neale, Carroll, & Rosson, 2004). In collaborative learning the teacher often becomes a facilitator rather than the primary source of knowledge or control. Collaborative learning also has a range of generic skills benefits, including the development of general communication abilities, empathy, and social skills.

Employers are demanding that students have teamwork skills. A recent report based on an email survey conducted by the Australian human resources company Diversiti (Diversiti, 2006) involving 365 employees (12% response rate) across a large range of states and company sizes indicated that the most important personal characteristic of high performing IT professionals was being a team player (64%), followed by capability to perform and learn (61%), energy and optimism (46%), adaptable to changes (43%), passion for IT/Determination to succeed/multi-tasking and work balance (all 26%). Factors influencing hiring decisions placed more emphasis on other areas such as: motivation and results driven (98%), communication skills (98%) and demonstrated achievement in relevant skill area (96%). Nevertheless "cultural fit to team" scored 94%, ahead of other factors such as prior work experience (93%), references, and academic results. Results from the US are similar, with industry advising that while most graduates have satisfactory technical skills, their teamwork abilities are often deficient (Waite, Jackson, Diwan, & Leonardi, 2004). In the current climate of declining ICT enrolments delivering degrees that employees want and students need has never been more important.

From discourse with colleagues in the Computer Science Education field it appears that many computing subjects offer few opportunities for collaborative work. Since working in teams is a necessary skill to succeed in the IT industry and a good way to learn, we must ask ourselves why collaborative learning is not used more frequently. We offer the following reasons:

Fear of plagiarism or freeloading
Inactive team members won't be presenting their own work but will be presenting the work of their team members, which is unethical and also a potential source of friction between students.

Student reticence
Students want to receive credit where credit is due. When they are part of a team, their individual efforts may not be recognised. As well, students (especially computing students) may want to avoid peer interaction either due to self-confidence, lack of enjoyment, or for the increased time cost involved in collaborating with others.

Effort
It takes a lot of effort to design activities that involve interaction and collaboration and even more effort to manage if a group or activity gets into trouble. This is exacerbated when academics are not comfortable or informed when it comes to implementing collaborative techniques.

Assessment
If people work in a team and produce a combined deliverable, it is difficult to accurately identify the contribution of each student and fairly apportion the marks. Some institutions, including Macquarie, place restrictions on the amount of groupwork permitted for this reason.

Technical support
Technology is sometimes needed to assist the group to work due to differing study/work commitments, stages of life, and locations. Academics may avoid collaboration using online approaches due to unfamiliarity or because of the administrative overhead and risk of technical problems that it carries.

Taken together, these reasons present a persuasive disincentive to adopt collaborative approaches. In order for academics to utilise collaborative learning techniques they need to be aware of the range of opportunities available, convinced of their potentials, and provided with support to navigate possible pitfalls. In the next section results from a student survey provide substantial evidence supporting the use of collaborative learning techniques, as well as highlighting some of the associated issues surrounding implementation of such techniques. In the section that follows a range of collaborative strategies based on findings from the literature and our own experience are presented, as well as research results, for evaluative purposes.

Collaborative learning – the students' perspective

In the US, Barker et al. (Barker, Garvin-Doxas, & Jackson, 2002) conducted a National Science Foundation funded ethnographic research to study the nature of the learning environment in computer science classrooms. They found that a culture of guarded behavior in an impersonal environment, and the presence of informal hierarchies of learners had led to competitive behaviors. They concluded that the defensive climate based on competitiveness rather than cooperation, judgments about others, superiority and lack of empathy inhibited collaboration, and that this culture needed to be addressed before effective learning could occur.

In order to ascertain our students' disposition towards collaborative learning, in 2004 we conducted a survey relating to various aspects of our teaching and student learning. A 30 item online questionnaire was issued to 196 of our undergraduate students in second and third year and yielded 103 responses. The instrument was comprised of both open ended and closed (seven-point Likert scale) items. Closed response options ranged from very low (0) through to very high (6).

When asked to indicate "the importance of being able to work in a group for programming related roles" students indicated an average Likert scale rating of 5.2 out of a possible score of 6 (between 'high' and 'very high'). Students also strongly believed (average 5.10 out of 6) that they "need to be taught to work effectively with others". These responses were the highest scores of any questions on the survey instrument, and each was highly significant ($p < 0.001$), indicating the importance of providing opportunities for students to work in groups and learn about working in groups.

Students indicated that they spent an average of 28% of their time working with others. When asked how much time they would like to spend working with others the response was an average of 44%. This was a highly significant difference between the observed and desired amount of time spent working with others (paired *t*-test, $t = 7.78$, $df = 99$, $p < 0.001$). The 16% absolute difference becomes a more substantial figure when it is considered as a proportion; on average students wish to spend almost 60% more time working with others. Seventy-five percent of respondents believed that lecturers should provide more formal opportunities for working with others in the activities they set.

Students were also asked to rate their confidence in working with others, their enjoyment of working with others, and their general communication abilities. A positive linear correlation existed between the student's confidence in working with others and their self-perceived communication abilities ($\hat{\beta}_1 = 0.451$, $t = 5.07$, $p < 0.001$). Further there was a positive linear correlation between communication abilities and enjoyment of group work ($\hat{\beta}_1 = 0.396$, $t = 3.60$, $p < 0.001$). These results indicate that communication abilities affect confidence and enjoyment when working in groups. By providing structured collaborative opportunities that support the development of communication skills, academics can improve student confidence and enjoyment when it comes to working with others.

Time was identified as a critical factor for our students. The majority of students spent more than the prescribed 12 hours a week per computing subject, with several indicating that they spent more than 25 hours per week. Some students may be reluctant to participate in group projects and the like for the potential administrative and communicative overheads that may be incurred. Given the time impoverished nature of today's learners, it is important that collaborative processes are not only designed to be valuable learning experiences but also effective in terms of the time-cost they involve.

When asked what proportion of time was spent in activities such as reading, studying, programming, debugging and so on, assignments were generally the major component requiring 20% or more of students' time towards their computing subjects. Surprisingly, many indicated that they placed little emphasis on reading the text book and only 58 of the students responded that they found the lectures to be at least moderately helpful or helpful in learning computing. The most common response (20/74) to an open-ended question concerning what students would find most helpful to learn computing was "practical application/frequent problem solving practice". If students feel that practical activities are most effective in developing their understanding then academics need to support that process. Prescribing groupwork activities that allow for collaborative programming provides students with a way to help one another. This may not only help relieve some of the time pressures on students but also support the development of important generic problem solving abilities by observing the generic troubleshooting strategies of others (Jonassen & Hung, 2003). In the survey, students identified these potential benefits. When asked as to the benefits of collaborative learning, they cited alleviate frustration when stuck (27) as the most popular reason, followed by better understanding (16) and seeing multiple perspectives (12).

Nearly eighty percent of students identified some ways in which learning computing in isolation was inferior to working with their peers. However, students also identified some disadvantages of working in groups. Reasons such as fewer distractions (28), can focus on concept formation/difficult problems (14), can choose own pace (13), more time efficient (12) and less conflict (5), were cited.

We note that respondents considered individual study to still be an essential part of learning computing and thus our goal must not be to remove the opportunity for self-directed learning. As well, students may have some reservations about groupwork activities and display some reluctance in practice (Barker, Garvin-Doxas, & Jackson, 2002; Waite, Jackson, Diwan, & Leonardi, 2004). Yet based on the general feedback from this research there is solid support from students for academics to pursue collaborative learning activities.

Opportunities for collaborative learning

Given the value of collaboration identified by industry, students, and educators (below), we offer for consideration a range of potential options that involve some form of collaborative learning. The categories include research results from educational literature, to indicate the range of opportunities available and the relative merits of each. It should be noted that some of the techniques overlap to some extent and fall under multiple categories. To act as a point of reference for other educators, we discuss some of the options we have explored and issues we have encountered in our own implementations at Macquarie University.

In-class collaborative activities

The most direct and supervised way to encourage collaboration is through in-class collaborative activities. Several approaches are recommended in the literature.

Beck, Chizhik, & McElroy (2005) investigate the use of cooperative learning in introductory computing classes. The specific roles assigned in cooperative learning tasks (such as program reader, method executor, facilitator) provide a structure to support more equal involvement of all students. Roles also highlighted the different aspects of the programming process, and reducing the scope of responsibility provided a form of reductionism to help students avoid the cognitive overload that is often experienced when first learning to program. They found that there was a statistically significant difference between the cooperative learning group and the non-cooperative learning group on the final exam ($p = 0.01$). As well while the grades throughout the semester decreased for the non-cooperative learning group, they improved for the cooperative learning group (a highly statistically significant different in slopes, $p = 0.0073$).

A conversational classroom environment is recommended by Waite, Jackson, & Diwan (2003). They describe how transforming the classroom into a more conversational environment (both between students and with the professor) lead to a doubling of the percentage of A grades. This transformation from traditional transmission approaches to a more engaged and participatory environment promoted the development of shared understandings. This collaborative model requires students to adopt a more active, responsible approach to their education. Waite et al. identify the two primary resources for implementing their approach as being (1) techniques for creating interaction and (2) techniques for creating a sense of presence. They also identify two behaviors – persistence and commitment to emergence – that are critical to creating and sustaining the system as a whole.

Van Gorp & Grissom (2001) suggest collaborative activities such as:

- Code walkthroughs – where students step through provided code to predict output
- Group code writing tasks – such as “write psuedocode to simulate 500 coin tosses”
- Group debugging – where student teams find syntax and logical errors in a program
- Lecture note reconstruction – whereby students reconstruct lecture outlines from memory.

They report that the amount of student perceived collaborative activity in the course was positively correlated with student grades.

At Macquarie we have also experimented with the strategy of in-class student presentations. In our year long industry and group based unit, students meet weekly for an hour with the unit convenor to present topics from the textbook to one another. Students present for 15 minutes and the task is worth 10% of their total assessment. For a number of years these presentations were considered boring and poorly attended. In the past two years, by adding a mark for the level of engagement and making this activity peer assessed there has been a major turn around. Students have been treated to quizzes, games, movie tickets and chocolate bars by inventive presenters. This highlights the way in which simple changes to the structure and assessment of collaborative tasks can positively affect performance.

As well, automated response technology has been incorporated into some lectures (Braiding, Richards, & Vaughan, 2006). Handheld keypads and supporting software are used to elicit, evaluate and present student responses to questions posed by the teacher in lectures and tutorials. The anonymity provided by the system, as opposed to asking students to vote for a solution by raising their hand, encourages shy or unconfident students to participate. The group results provide immediate feedback to the student as well as the teacher. The system can be programmed to automatically collect individual responses, show solutions and prepare selected statistics for student and teacher diagnosis.

Macquarie University is also using the Adobe Breeze platform to facilitate in-class collaborative approaches to learning (Bower, 2006). Since the text chat does not interfere with the lecturer's audio broadcast, students can hold discussions about the material during an instructors' presentation. It is also possible for all students to respond to a lecturer question simultaneously, improving both the degree of involvement and the efficiency of collaboration. Under this form of collaboration students feel that they both collaborate more and learn more as opposed to face-to-face (Bower & Richards, 2005).

Other educators also report the benefits of using technology to assist in class collaborative approaches. Simon et al. (2004) investigated the use of Tablet PCs to promote active learning in computer science. They point out that such technology has the advantage of allowing instructors to select answers rather than students – the technology has the ability to filter out identities more easily than in a face-to-face classroom. As well, they note that sharing of different students (or groups of students) spontaneous attempts to solve problems "provided an opportunity to point out common mistakes and allowed comparison of different approaches to the same problem" and that "the instructor also received immediate feedback on whether or not students understood" (p. 215).

Research by Graciela (2006) indicates that in-class collaborative approaches may have positive effects beyond the completion of the subject in which they occur. They deployed a systematic in-class collaborative approach involving group discussions to review previous work (followed by a short lecture to present new material) and planned groupwork activities. This resulted in 70% of students who were exposed to the active learning experience in CS1 also passing CS2, as opposed to only 44% who weren't exposed to the active learning approach in the previous subject. As well, the dropout rate in CS2 was only 10% for students who underwent active learning in CS1 as opposed to 25% for those who did not.

Peer review

Learning can be assisted by reviewing the work of peers and conversely by receiving review from peers. Peer review allows students to integrate vertically with more advanced students and have students learn from exposure to more coding applications without the burden of having to program it themselves. As well as there being advantages of peer review for students, there are also several advantages for academics. For instance, Gehringer et al. note that their online submit and peer review system builds a databank of code relating to specific topics that can then be used as resources for future activities (Gehringer, Chinn, Perez-Quinones, & Ardis, 2005).

Students appreciate peer review approaches. Gehringer (2001) reports on a Submit-Review-Publish cycle for learning computing. The reviews allowed students to revise their solutions before final submission. Each submission was double-blind reviewed by multiple reviewers, in much the same way as many conference paper submissions are handled. The benefits, as with conference paper refereeing is that the reviewer is kept informed of the latest research in the area while also offering their insights and comments based on their expertise. Feedback from students indicated that the approach helped them to improve the quality of their work.

In other instances, systems have been specifically designed to provide the benefits that can be derived from peer review processes. The Collaborative Algorithm Representations Of Undergraduates for Self-Enhanced Learning (CAROUSEL) system was purpose built to facilitate peer evaluation and feedback of student created visual representations of computing algorithms (Hűbscher-Younger & Narayanan, 2003). Whereas previous attempts with using animations to improve student comprehension of computing algorithms had proved unsuccessful, researchers found a significant positive relationship between these constructive and collaborative feedback-based activities and algorithm learning.

At Macquarie we have often used in-class peer review, to offer both parties the opportunity to gain a better understanding of the concepts in a timely manner. This process allows the reviewee to use findings to immediately redevelop their initial submission, and the reviewer to apply the reflections to their own work. These capacities to build on the work of others, review code, conduct structured walkthroughs and various other formal and informal review methods are valuable system development and maintenance skills that our IT graduates require for the workforce.

As an extension to peer review, students' marks or comments can be either directly assigned or used to guide assessment marks allocated by a teacher. For instance, in the Submit-Review-Publish approach used by Gehringer (2001) the average of the blind reviewers marks was used. At Macquarie we have used peer assessment to assign marks in two third-year units. In one unit, students assess the presentations of other students. In the other unit, students assess the software solutions offered to a problem that has been posed to all groups. For quality assurance purposes the lecturer has continued to perform their own assessment. Astonishingly, the average mark based on the students' scores (15-40 students) tended to be within half a mark of that awarded by the lecturer, though on some occasions the deviations can be large. An alternative strategy to ensure equity is to have the same student/s mark the same question/task for the whole class to allow them to develop a more refined sense of the differences between solutions.

Adjunct collaborative frameworks

There are several ways in which academics can provide general collaborative frameworks to support their courses. For instance, Chase and Okie (2000) introduced a peer and cooperative learning framework in a first course for Computer Science majors. This involved appointment of an undergraduate peer instructor as a co-teacher, and careful formation of groups based on personality types and using team-building activities. Groups were responsible for their members and if anyone fell behind or couldn't attend classes the group were responsible for bringing them up-to-date. Each new lecture topic was followed by a group assignment, which was then followed by an individual assignment. The results at the end of the term showed an improvement from 56% receiving a conceded pass or below to 32%. Significantly, the rate for female students changed from 53% to 15%.

Scharff & Brown (2004) report on the efficacy of creating holistic Learning Communities as a means to improving learning outcomes. Their Learning Community approach involved integrating curricula of a course in logic with their introductory computer science unit in order to provide a mutually supportive framework for the logico-deductive aspects of the material. By identifying a common group of students and prescribing common assessment tasks between the two subjects, student feedback indicated the learning community approach offered significant support to their learning and was a contributing factor to their improved understanding.

Mentoring is another form of student interaction that can provide benefits to both the mentors and their protégés. Mentors don't necessarily need to be much older or significantly more experienced, but they do need to have at least experienced the process that their apprentice is going through, such as having completed the unit of study successfully in the past. Protégés are provided with technical and social support, while mentors benefit from improved communication skills, confidence building and intrinsic rewards. In the mentoring program in our large first-Computing unit the students that volunteered to meet weekly with their two mentors reported that they found the experience helpful. A similar program at Sydney University found that 94% of mentors from one year were willing to volunteer for the program in the following year (Miller & Kay, 2002). Providing students with industry placements is another way to offer students the possibility for mentor relationships to be developed.

Extended team-based tasks

A common way that educators seek to incorporate collaborative learning is via the use of group-based tasks. A tpical example might include students working together for a significant proportion of the subject to deliver a substantial artefact such as a software system and/or supporting documentation. Here we are concerned with groups that form to solve a large problem or perform an extensive task that will be assessed. There are a variety of approaches that can be adopted.

The University of Sydney Basser Department of Computer Science has experimented with Problem Based Learning (PBL) approaches to teaching programming (Kay et al., 2000), which emphasises:

1. open ended, authentic and substantial problems which drive learning
2. explicit teaching and assessment of generic and metacognitive skills, and
3. collaborative learning in groups.

In the approach students are presented with an authentic problem (for instance, implementing a supermarket checkout queue simulator) that is used both as a driving force to develop metacognitive skills (for instance reflection upon steps taken to solve the problem and delegation of time) and for the subject of groupwork (externalising knowledge, developing collaborative skills). Kay et al. (2000) found that over the two year period since the introduction of Problem Based Learning into their Introduction to Computer Science unit the mean examination mark improved from 63% to 91%. They also note some positive affects on student satisfaction with the unit, as measured through an open ended questionnaire they deployed.

Joseph and Payne (2003) tested the use of cooperative learning groups in an undergraduate computing course. All course requirements were to be met via in class and out of class interaction with their group, however, individual grades were awarded for each task. Group tasks included textbook problems, in-class activities and a group project, three in-class and one final examination. It was found that students with the highest activity scores in the cooperative learning groups also scored significantly better in the final exam, indicating that engagement is a critical factor in successfully implementing extended team based work.

Technology is becoming a popular mechanism to implement distributed collaborative projects. Hause et al. (2001) contrasted the collaborations of a high and low performing team that participated in the Runstone project. This project involved distributed teams of third year students from Uppsala University (Sweden) and Grand Valley State University (US) creating software in teams using email, IRC chat, and shared webspace. Cheng and Beaumont (2004) have also used multimodal Computer Supported Collaborative Learning (CSCL) techniques to distributed PBL (dPBL) tasks. Finally, at Macquarie we have experimented with the use of wikis to facilitate semester long group projects in our Master of IT course (Bower, Woo, Roberts, & Watters, 2006). The successfulness of these approaches as compared to face-to-face techniques is still a point of conjecture.

Macquarie University's computing degree includes a project-based unit in which students experience working in a team. This approach provides the benefits of situated learning, showing students the relevance of their studies and offering them industry experience. However, such experiences need to be carefully managed. Management is heavily dependent on the structure and context (for instance whether placement is for individuals or a cohort of students). Key factors to consider are how individuals/groups are allocated, how resources are distributed and how activities are monitored.

Often collaborative project tasks can carry an assessment weighting, which can be a concern in terms of fairness and equity. Strategies that we have found can address this include:

- private submission of an 'Individual Contribution Form' to more accurately determine the actual contribution by each student
- the use of interviews and student journals to determine the extent of student activity in a task
- allocation of members to the group based on aptitude (for instance, grade point averages) to avoid disadvantaging a more capable member of the group due to biases in ability.

Out-of-class distributed activities

Online technologies allow academics to design collaborative activities that do not require students to physically assemble or even be online at the same time. An advantage of these sorts of approaches is that the technology generally allows the teacher to track collaborations for assessment and review purposes. Typical technologies include discussion boards, wikis, and virtual classrooms.

Clark (2000) points out that discussion boards allow students to make more reflective, extended contributions than face-to-face discussions. By providing temporal flexibility to collaborative design activities students are able to carefully compose their thoughts and make more complex, interrelated responses. Clark notes how for these sorts of tasks more structured specification positively affected the quality of postings.

Wikis also allow students to perform asynchronous online collaboration, with the added capacity to structure, re-structure and interlink content. Learning designs can include collaborative artefact creation, the formation of micropedias and glossaries, and mini-problem solving activities. Macquarie University has experimented with the use of wikis for facilitating weekly extension activities, with students indicating that the wiki allowed them to form negotiated meanings that may not have emerged if they were working face-to-face (Bower, Woo, Roberts, & Watters, 2006).

Finally, advances in virtual classroom technologies allow students to collaborate on distributed tasks in a synchronous mode. Macquarie University is using the Adobe Breeze platform not only for online classes, but also to facilitate out-of-class collaborative activities such as group-programming and pre-tutorial preparation tasks (Bower, 2006). These approaches allow students to access immediate support and feedback while still being out-of-class and potentially separated by large distances.

Programming in teams

'Programming in teams' is a subset of both extended team-based tasks and in-class activities which deserves special attention because of its applied, skill based nature and its frequent deployment in the Computer Science curriculum. System development methodologies such as Extreme Programming (XP) and Rapid Applications Development (RAD) have been used in industry for some time now. Concepts such as pair-programming (used in XP), version control, change management, integrated development environment (IDEs), documentation, testing and debugging only start to make real sense when students work on programming projects that require teams. Research relating to the use of programming in teams (specifically, pair-programming activities) as a learning strategy has been invariably positive in the results they report, as indicated by the following examples.

McDowell et al. (2002) examined 313 students across two semesters to gauge the effect of pair programming. In the semester where pair programming was used to complete assignments, the scores that students received were significantly higher ($n_1 = 172$, $\overline{x}_1 = 86\%$, $s_1 = 14\%$, vs $n_2 = 141$, $\overline{x}_2 = 67\%$, $s_2 = 20\%$, two sample t-test $p < 0.001$). As well, the course completion rate for the semester where pair programming was used maintained a 92% completion rate as opposed to the non-pairing semester which maintained a 76% completion rate.

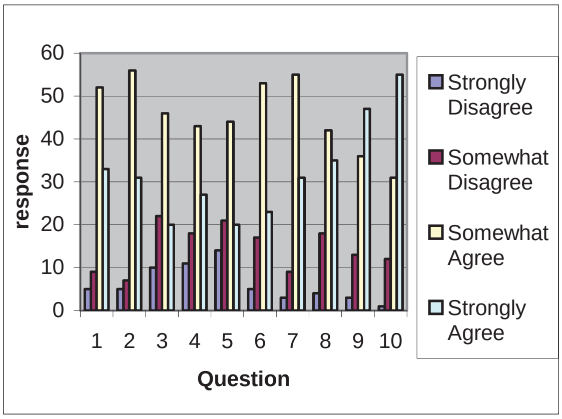
Nagappan et al. (2003) also investigate the use of pair programming in their introductory computing course. They report that pair programmers were more self-sufficient, generally performed better on projects and exams, and were more likely to receive a grade C or higher for the course than their solo counterparts. As well, both students and lab instructors report a more productive and less frustrating laboratory environment. They note that this supports several previous studies which indicated that pair programmers produce higher quality code in about half the time of solo programmers.

Williams and Upchurch (2001) support the qualitative outcomes of pair programming activities. They note that pair programming not only enhances student learning and satisfaction, but reduces the amount of support that students require from educators. They found that the pair-programming approach they implemented led to higher quality code as a result of the continuous review provided within teams. They also describe the team-building and communication skills development that the strategy encourages.

While pair programming is not necessarily an industry standard, designing, developing and testing code in groups is the norm. To this end we have incorporated group-based programming assignments at second year level and will explore providing this experience in first year. Based on our research into collaborative learning and the identified need to carefully select groups, provide clear and well designed task specifications, implement systems to ensure equal participation and fair discrimination between individual contributions in assessment, we have been able to design and implement a collaborative experience that the students deem positive. The feedback reported below relates to a second year unit which provided approximately 120 students with their first introduction to Object Oriented Programming using Java.

Table 1: Survey questions and student responses

1. I learnt more by working in a group than if I'd done the assignment on my own. SD-5%, D-9%, A-53%, SA-33%
2. I enjoyed working in a group SD-5%, D-7%, A-57%, SA-31%
3. It was easy to get the group to work together SD-10%, D-22%, A-48%, SA-20%
4. It was easier to get the task done by working in a group than if I'd done the assignment on my own. SD-11%, D-18%, A-44%, SA-27%
5. I would like more assignments to involve group work. SD-14%, D-21%, A-45%, SA-20%
6. Everyone in my team did an equal share. SD-5%, D-17%, A-55%, SA-23%
7. Most people in my team did an equal share SD-3%, D-9%, A-56%, SA-32%
8. I think programming and testing works well with groups SD-4%, D-18%, A-43%, SA-35%
9. I think training to work in groups is needed SD-3%, D-13%, A-36%, SA-38%
10. I think choosing our own groups is best SD-1%, D-2%, A-31%, SA-56%



Note. Students clearly indicated that working in groups was beneficial. Refer to Table 1 to look up the question

Figure 1: Table 1 as a bar chart

The participation rate and normalised average mark in the groupwork assignment were higher than the other two assignments, though it is difficult to compare the three assignments which sought to test different skills, knowledge and competencies at different phases of the course. However, simply because a team was involved, a bigger problem could be given and a more comprehensive solution produced. Taken together, better performance and increased student satisfaction demonstrate that programming in teams can operate successfully and improve educational outcomes.

Summary and conclusion

This paper provides evidence supporting the use of collaborative learning, as well as a number of strategies that can be used. Issues relating to the various approaches have been discussed and comparisons have been made. Implementing group based tasks carries an intrinsic administrative overhead for teachers and students. Yet students need to have experience with working in groups if for nothing else to develop the generic skills required by industry. For that reason alone lecturers need to provide collaborative learning opportunities, which means understanding the various approaches, their disadvantages and their issues. However we have shown that in addition to developing generic skills, collaborative approaches also have the potential to improve learning outcomes. A summary of the possibilities and limitations is provided in Table 2 below. The summary is not intended to be definitive but hopefully presents a basis from which debate can occur.

No matter which approach to collaboration is adopted, it has become clear to us that success lies in the implementation, and not in the specific approach. However there are differences between approaches, and as such educators need to carefully match the collaborative approach to the learning requirements of the task. By presenting a range of collaborative strategies available and identifying the limitations and possibilities inherent in each it is intended that other academics will be both more inclined and able to integrate collaborative learning into their curricula from a more informed point of view.

Table 2: Summary of the issues and benefits of different collaborative learning strategies

	In-class Group Activities	Peer Review	Adjunct Collaborative Frameworks	Extended Team-Based Tasks	Out-of-class Distributed Activities	Group Programming
Plagiarism/ Freeloading	Potentially	No, if well structured	Potentially	Potentially	Low, since trackable	Potentially
Student reticence	Potentially	low	Low	Potentially	Low, due to flexibility	Potentially
Teacher effort	High	High	Initially high, lower ongoing	High maintain, lower marking	Low	Initially high low ongoing
Assessment discrimin. issues	Potentially	Low	No	High	Low	Potentially
Technological overhead	High if using collab. tech.	High if using online system	High if through collab. tech.	High if using collab. tech.	High	Low
Develops social networks	High	Depends on design	High	High	Depends on design	High
Troubleshooting Support	High	Low	Potentially	High	Potentially	High
Teachers communication	High	Medium	Medium	High	High	High
Meets industry needs/skill	Potentially	Review skills	Low	Project skills	High	Yes
Engagement with problem	High, espec. cooperative tsks	Medium	Low	High, unless freeloading	High, due to accountability	High, unless freeloading

References

Barker, L. J., Garvin-Doxas, K., & Jackson, M. (2002). *Defensive climate in the computer science classroom.* Proceedings of the 33rd SIGCSE technical symposium on Computer science education, pp. 43–47.

Beck, L. L., Chizhik, A. W., & McElroy, A. C. (2005). *Cooperative learning techniques in CS1: design and experimental evaluation.* Proceedings of the 36th SIGCSE technical symposium on Computer science education, St. Louis, Missouri, USA, pp. 470–474.

Bower, M. (2006). *Virtual Classroom Pedagogy.* Thirty-Sixth SIGCSE Technical Symposium of Computer Science Education, St. Louis, Missouri, USA, pp. 148–152.

Bower, M., & Richards, D. (2005). *The Impact of Virtual Classroom Laboratories in Computer Science Education.* Thirty-Sixth SIGCSE Technical Symposium of Computer Science Education, St. Louis, Missouri, USA, pp. 292–296.

Bower, M., Woo, K., Roberts, M., & Watters, P. (2006). *Wiki Pedagogy – A Tale of Two Wikis.* Information Technology based Higher Education and Training, Sydney, pp. 187–198.

Braiding, C., Richards, D., & Vaughan, A. (2006). *Fun and feedback at the press of a button.* Proceedings of the Australasian Society for Computers In Learning in Tertiary Education, Sydney, NSW.

Chase, J. D., & Okie, E. G. (2000). *Combining cooperative learning and peer instruction in introductory computer science.* Proceedings of the thirty-first SIGCSE technical symposium on Computer Science Education, Austin, Texas, United States, pp. 372–376.

Cheng, C. S., & Beaumont, C. (2004). Evaluating the effectiveness of ICT to support globally distributed PBL teams. *Proceedings of the 9th annual SIGCSE conference on Innovation and technology in computer science education* (pp. 47–51). Leeds, United Kingdom: ACM Press.

Clark, M. (2000). *Getting participation through discussion.* Proceedings of the thirty-first SIGCSE technical symposium on Computer science education, Austin, Texas, United States, pp. 129–133.

Diversiti. (2006). Diversiti IT Hiring Influence Report. http://www.diversiti.com.au/Diversiti_CMS/Content/Documents/Diversiti%20IT%20Hiring%20Influence%20Report%202006.pdf [viewed 12 Sept 2006].

Gehringer, E. F. (2001). *Electronic peer review and peer grading in computer-science courses.* Proceedings of the thirty-second SIGCSE technical symposium on Computer Science Education, pp. 139–143.

Gehringer, E. F., Chinn, D. D., Perez-Quinones, M. A., & Ardis, M. A. (2005). *Using peer review in teaching computing.* Proceedings of the 36th SIGCSE technical symposium on Computer science education, St. Louis, Missouri, USA, pp. 321–322.

Graciela, G. (2006). *A systematic approach to active and cooperative learning in CS1 and its effects on CS2.* Proceedings of the 37th SIGCSE technical symposium on Computer science education, Houston,

Texas, USA, pp. 133–137.
Hause, M. L., Almstrum, V. L., Last, M. Z., & Woodroffe, M. R. (2001). *Interaction factors in software development performance in distributed student teams in computer science.* Proceedings of the 6th annual conference on Innovation and technology in computer science education, Canterbury, United Kingdom, pp. 69–72.
Hűbscher-Younger, T., & Narayanan, N. H. (2003). *Constructive and collaborative learning of algorithms.* Proceedings of the 34th SIGCSE technical symposium on computer science education, pp. 6–10.
Jonassen, D. H., & Hung, W. (2003). Learning to Troubleshoot: A New Theory-Based Design Architecture. http://www.coe.missouri.edu/~jonassen/Troubleshooting.pdf [viewed 12 Sept 2006].
Jonassen, D. H., Lee, C. B., Yang, C.-C., & Laffey, J. (2005). The Collaboration Principle in Multimedia Learning. In R. E. Mayer (Ed.), *The Cambridge Handbook of Multimedia Learning* (pp. 247–270). New York: Cambridge University Press.
Joseph, A., & Payne, M. (2003). Group dynamics and collaborative group performance. *Proceedings of the 34th SIGCSE technical symposium on Computer science education* (pp. 368–371): ACM Press.
Kay, J., Barg, M., Fekete, A., Greening, T., Hollands, O., Kingston, J. H., et al. (2000). Problem-Based Learning for Foundation Computer Science Courses. *Computer Science Education,* 10(2), 109–128.
McDowell, C., Werner, L., Bullock, H., & Fernald, J. (2002). The effects of pair-programming on performance in an introductory programming course. *Proceedings of the 33rd SIGCSE technical symposium on Computer science education* (pp. 38–42): ACM Press.
Miller, A., & Kay, J. (2002). *A mentor program in CS1*. Proceedings of the 7th annual conference on Innovation and technology in computer science education, Aarhus, Denmark, pp. 9–13.
Nagappan, N., Williams, L., Ferzli, M., Wiebe, E., Yang, K., Miller, C., et al. (2003). *Improving the CS1 experience with pair programming.* Proceedings of the 34th SIGCSE technical symposium on computer science education, pp. 359–362.
Neale, D. C., Carroll, J. M., & Rosson, M. B. (2004). *Evaluating computer-supported cooperative work: models and frameworks.* Proceedings of the 2004 ACM conference on computer supported cooperative work, Chicago, Illinois, USA, pp. 112–121.
Scharff, C., & Brown, H. (2004). Thinking Through Computing: The Power of Learning Communities. *Computer Science Education,* 14(4), 297–320.
Simon, B., Anderson, R., Hoyer, C., & Su, J. (2004). *Preliminary experiences with a tablet PC based system to support active learning in computer science courses.* Proceedings of the 9th annual SIGCSE conference on Innovation and technology in computer science education, Leeds, United Kingdom, pp. 213–217.
Van Gorp, M. J., & Grissom, S. (2001). An Empirical Evaluation of Using Constructive Classroom Activities to Teach Introductory Programming. *Computer Science Education,* 11(3), 247–260.
Vygotsky, L. S. (1978). *Mind in Society*: Cambridge, MA: Harvard University Press.
Waite, W. M., Jackson, M. H., & Diwan, A. (2003). *The conversational classroom.* Proceedings of the 34th SIGCSE technical symposium on computer science education, pp. 127–131.
Waite, W. M., Jackson, M. H., Diwan, A., & Leonardi, P. M. (2004). *Student culture vs group work in computer science.* Proceedings of the 35th SIGCSE technical symposium on Computer science education, Norfolk, Virginia, USA, pp. 12–16.
Williams, L., & Upchurch, R. L. (2001). In support of student pair-programming. *Proceedings of the thirty-second SIGCSE technical symposium on Computer Science Education* (pp. 327-331): ACM Press.

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An Agile method for developing learning objects

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There is considerable international interest in learning objects. The emphasis on technical issues such as standardisation of metadata schemes and software packaging has diverted attention from the central issues of how to develop pedagogically effective learning objects. This paper presents the development methodology of the UK Centre for Excellence in Teaching and Learning (CETL) for Reusable Learning Objects. This is an 'Agile' approach that balances the requirement for flexibility to fit a pressurised work environment with the need to facilitate the development of high quality resources. The approach is grounded in front line practice, including the development of EASA award winning learning objects. The paper outlines this method from problem identification, through design, to learning object production. It complements the earlier work on design principles and heuristics to provide a comprehensive and flexible framework for learning object development.

Keywords: reusable learning objects, methodology, agile methods

Introduction

There have been two major strands of work on learning objects. The first strand has focused on developing international standards and specifications for learning object metadata and packaging (IEEE, 2002; IMS, 2005; SCORM, 2004). This provides standard ways of packaging and describing learning objects – that have already been created. It says little, however, about how to create standalone, pedagogically effective learning objects in the first place. The second major strand has focused on filling this gap by providing pedagogical and structural design principles for creating learning objects (Boyle, 2003; Bradley & Boyle, 2004). These principles provide orienting heuristics to guide the design process. An important complement of this approach is to provide a full life-cycle framework that guides designers in moving from problem identification through to learning object production. This paper aims to elucidate the methodology developed to meet this challenge by the Centre for Excellence in Teaching and Learning (CETL) in Reusable Learning Objects.

The CETL commenced in April 2005 with funding of £3.3 million (since extended to £3.44m) from the Higher Education Funding Council for England (HEFCE). The CETL is a partnership of three universities: London Metropolitan University, University of Cambridge and the University of Nottingham, to develop and evaluate learning objects across a range of subject areas. These learning objects are used and evaluated with a minimum of 2000 students across the three institutions each year. The CETL also has a major staff development programme, and works to support communities outside the CETL partnership in developing and evaluating learning objects (RLO-CETL, 2006).

There were two major influences on the development of the CETL methodology. The first is the extensive experience of the partners in developing learning objects. This includes work at London Metropolitan University in developing learning objects for programming that led to a European Academic Software Award in 2004 (EASA, 2004). It also includes the work of the Universities of Cambridge and Nottingham in developing learning objects for a range of subjects including Nursing and Health Science (SONET, 2006; Leeder, McLachlan, Rodrigues, Stephens, Wharrad. & McElduff, 2004). The methodology described is grounded in this extensive experience, and that gained during the first year of CETL operations.

The second major influence is that of 'Agile' development methods, especially DSDM (Stapleton, 1997; Yeomans, 2000). Agile methods grew out of the rejection of heavyweight, bureaucratic approaches to software development such as the Waterfall method. The Agile approach aims to “Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done” (Agile Manifesto, 2001). The Agile approach provides an ethos and process that links the grounded categories derived from the empirical base into a wider conceptual perspective. These two major influences on the development of the CETL methodology are summarised in Figure 1.

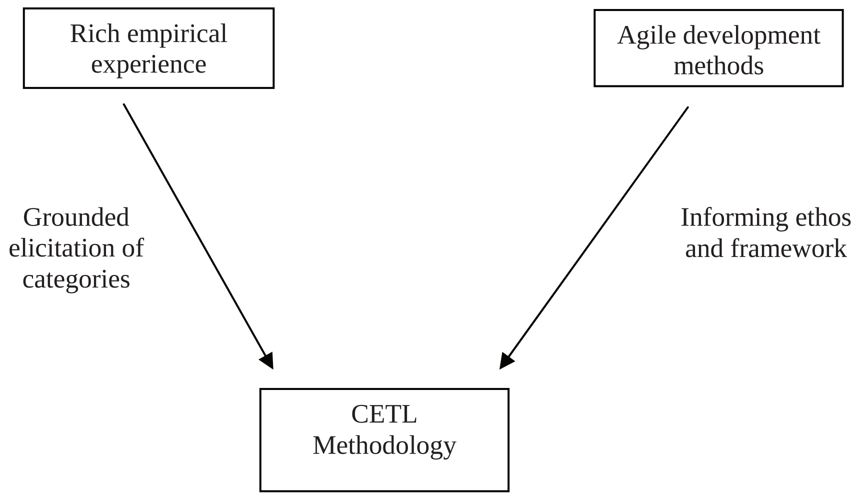

Figure 1: Influences on the development of the CETL methodology

Overview of the method

The aim is to provide a robust and flexible framework that will support the development of high quality learning objects**.** The need is to produce a light ‘agile’ development method that is structured but adaptable to local circumstances. The methodology should allow the development team to achieve the best route to creating effective learning objects in the context of local opportunities and constraints. To achieve this flexibility it is useful to focus initially on the key development functions that need to be covered. The key high level functions that need to be covered are:

- analysis of learner needs
- design
- development
- delivery
- evaluation.

The methodology aims to provide a flexible framework that provides structures and processes to realise these functions. The central focus is on producing high quality learning objects. The methodology should assist the development teams to find the best route to achieve this in the context of the particular project. To do this there has to be an appropriate balance of structure and flexibility. Each project follows a path through the CETL development framework, which covers the main development functions. However, no two paths have to be exactly the same. The optimal path is a mapping from the main development methodology that best suits local circumstances.

Most development projects involve more than one learning object. A batch of learning objects is usually developed to meet the learners’ needs. Each project has thus embedded within it a series of strands – one for each learning object developed – which can operate at least partially in parallel. Development is carried out by collaborative groups of academic tutors and multimedia developers, in which:

- the academic tutors are responsible for the conceptual (pedagogical) design of the learning object, while the multimedia developers provide expertise in presentation (multimedia) design and development
- there is close involvement of academic staff in the whole life cycle of development, delivery and evaluation of the learning objects
- there is a strong emphasis on quality assurance and student evaluation.

The framework emphasises the need to understand the problem before designing the solution. Projects should start, therefore, with an analysis of the learner's needs. The output of this analysis informs the design and development process. Design and development is an iterative process involving a collaborative group, including centrally the academic tutor(s) and a multimedia developer. An important feature of the method is that the learning objects are then used with significant groups of students. There is "use before reuse". The use with students provides a basis for evaluating the extent to which the learning objects have met the original objectives. Finally, and only at this stage, are the learning objects packaged, with full metadata description, and stored in a repository for wider reuse.

Figure 2 presents a diagrammatic outline of the main stages. The following sections discuss, in turn, the main phases in the development of learning objects: analysis of learner needs and initial RLO specification; design and development; delivery and evaluation, and packaging for reuse.

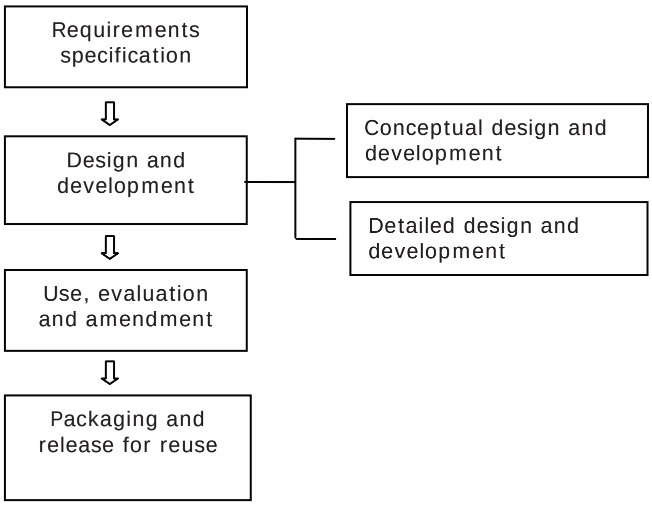

Figure 2: High level overview of development methodology

Learning needs and project specification

The seeds of a new project reside in a number of questions. What are the problems the students face? How might the availability of new learning objects help the students to deal with these problems? Can learning objects offer a new learning opportunity that will extend the quality of the learning experience of students? A further important issue – is there widespread scope for the reuse of the learning objects developed?

A weakness of many educational artefacts is that they are not based on a proper analysis of learner needs. The RLO-CETL places a strong emphasis on understanding problems before attempting to produce the solutions. The main expertise for this comes from subject tutor(s) who teach the students and have an intimate understanding of the problems students experience.

The initial phase typically takes the form of an informal discussion between the tutor(s) and the local academic co-ordinator (LAC). Each LAC manages and co-ordinates learning object developments in their home institution. This may be initiated by the CETL team identifying a topic and approaching tutors, or by a tutor approaching the CETL with an outline proposal. The discussion focuses on the student problems and how these can be addressed by developing learning objects to produce an enhanced learning experience for the students. The culmination of successful discussions is the initiation of a project by signing the Project Agreement form.

Another technique the CETL uses at this early stage is to run workshops where staff generate ideas for the possible learning objects. These workshops involve both identifying ‘common’ problems and brainstorming outline design specifications. We involve students in these workshops to provide the ‘student view’, as well as the tutor views. The one-day workshops provide a telescoped analysis and initial design of possible learning objects. Promising ideas are followed up through a full project development cycle. There is also an extended residential event for CETL staff, held annually in June, which provides a deeper and more sustained exploration of problems and possible design solutions. A strong cohort of students is present during this event. Our experience is that this acts as an important input to balance and correct, where appropriate, staff views of the issues (Cook, Leeder, Wharrad, Morales & Boyle, 2004).

Projects operate within constraints of time and local context. The basic requirement of the first phase is to have a baseline understanding of the problem and a specification for developing learning object(s) to tackle it. This specification sets clear challenges that we expect the design phase to tackle. It should also provide a baseline for the evaluation of the learning objects – to what extent do they deal effectively with the challenges/problems identified in the analysis phase?

The Project Agreement sets out the aims and objectives of the project (e.g. develop fifteen learning objects to enhance study skills in first year university students). The tutor agrees to both develop and evaluate the learning objects with a substantial cohort of students. The CETL provides funding to release the tutors time to work on the development process (typically around £7/8k). A multimedia developer and an evaluator are assigned to the project. At this stage the tutor also agrees to the licence that will govern the distribution and reuse of the learning objects.

Table 1: Summary of phase 1 activities and outcome

Main personnel	Activities	Supporting documents	Outcome
Tutor(s)	Propose outline ideas for learning objects Refine in light of LAC feedback		
Local academic co-ordinator (LAC)	• Discuss ideas with tutor. • Help tutor refine ideas to be suitable for RLO development • Support tutor to write project specification	The standard project specification template form	Signed project specification form, with agreed funding and allocation of resources to project

Note. This table is a summary of a dynamic process. The tutor may consult with other tutors and preferably students in refining the ideas. The LAC will usually consult with other CETL personnel experienced in RLO development.

When the team and resources are allocated the project proper commences. The learning objects are developed in a series of ‘mini-project’ strands that may be conducted in parallel or in sequence, as determined by the development team. The core of the development team consists of the tutor(s) and the multimedia developer, supported by an evaluator. The management oversight of the project is provided by the local academic co-ordinator. The management ethos is to provide quality enhancement support that facilitates the successful execution of the project.

Design and development

The CETL aims to provide a framework that provides a flexible approach that adapts to individual circumstances, while ensuring quality control of the processes. The development methodology has to achieve a balance between project discipline on the one hand, and the dynamic flexibility required for real progress with staff working part time under difficult and often 'noisy' conditions.

There are two main approaches that feed into the CETL design and development approach. London Metropolitan University, where the tutors and multimedia developer work in close proximity, has developed an intense iterative approach were specification and development are intertwined in the development process. This approach was used to successfully develop the learning objects that won the EASA award. The Cambridge and Nottingham partners have developed a structured framework to support distributed development where the tutor and multimedia developer often reside in different institutions. This uses an approach with more clearly demarcated sub-phases of development.

The CETL treats these two as poles that specify a range within which an agile path may be chosen. The project development methodology supports both modes of development and supports variation between these two poles to suit local circumstances. The 'distributed mode', with its explicit separation of specification and development, is described first. This is followed by their description of the 'intensive iterative' mode where tutor and multimedia developer work intensely together, usually in close proximity.

Distributed development mode

This mode is based on a distributed development model where the tutor and multimedia developer often reside at different institutions. The production workflow with its accompanying templates was developed with the dual aims of a) supporting a community of practice that is geographically distributed and b) providing a framework to help new practitioners organise their expertise and materials in a format suitable for learning object production. The process is divided into stages, with clear quality checks and hand-over points.

The two main stages are 'design/content specification' and 'multimedia development'. In the content creation stage a specification for a learning object is created by a subject expert using a special template that helps them to organise their materials into a format suitable for RLO development. The specification is then dispatched for the first stage of peer-review. The peer-reviewer, who is the subject expert's counterpart, in another institution, is encouraged to be constructively critical and to offer suggestions for improvement. The author may be required to make some modifications before the RLO moves on to the next stage.

The specification and content supplied by the tutor are electronically dispatched to the developer. The developer then builds a multimedia learning object based on the specification. The resulting RLO is checked for functionality to ensure it works correctly. The RLO then goes out for the second phase peer-review (usually back to its first stage reviewer). This ensures that it meets the specification and that nothing has been lost in the development process. If necessary, it may be returned for further modifications and development. Finally, the RLO is delivered for use and student evaluation.

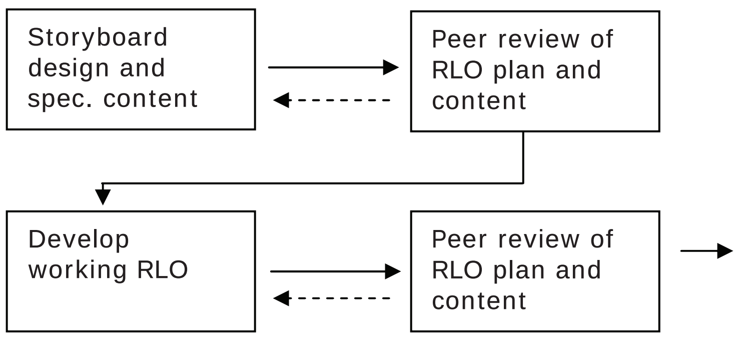

Figure 3: Summary of distributed development path

Intense iterative development

In the intense iterative mode of development the tutor and multimedia developer operate in close proximity. The development of the multimedia learning objects involves close, dynamic interaction between the module tutors and the multimedia developer. This supports a rapid prototyping style of development. The tutor will typically express their initial ideas on paper for the multimedia developer. This may lead to the development and initial prototype, which enables joint visualisation of the idea. Inspection of the prototype leads to ideas for further refinement and development. The prototype then 'evolves' through several of these intense cycles. The cycles of: *design ideas – prototype implementation – and critical evaluation* drive the development of the learning object. This approach is resonant of approaches to software development known as 'agile' or rapid application development (RAD) methods. These approaches emphasise:

- rapid, iterative prototyping
- the use of small agile teams
- user in the design team
- emphasis on products (prototypes) rather than following set processes
- tight timescales, sometimes controlled though explicit time-boxing (Yeomans, 2000).

A major advantage of this approach for the tutor is that they can see the evolving visualisation of the idea. This can be a considerable help in translating their ideas into an animated visual format. Because iterative prototypes are produced, students can be asked to express their views of the evolving learning object. This approach thus permits critical, constructive evaluation to be incorporated early in the design phase. This permits problems to be detected early, and hopefully, corrected or removed. A possible disadvantage from the multimedia developer's point of view is that the tutor may not express their ideas explicitly enough, for example, through storyboards. There can be a tension between the multimedia developer's preference for fuller storyboards and what the tutor may supply.

Learning objects are small and relatively self-contained. This means that parallel development on several learning objects can take place at the same time, with partially overlapping personnel. The multimedia developer, for example, may be shared across different teams. Prototypes may be posted on an Intranet site dedicated to the projects. Members of the wider group can provide constructive comments on the prototypes as they are developed. This 'spiral' model of development is illustrated in Figure 4. This Figure makes explicit that refinement of the specification is a natural part of this dynamic, iterative process.

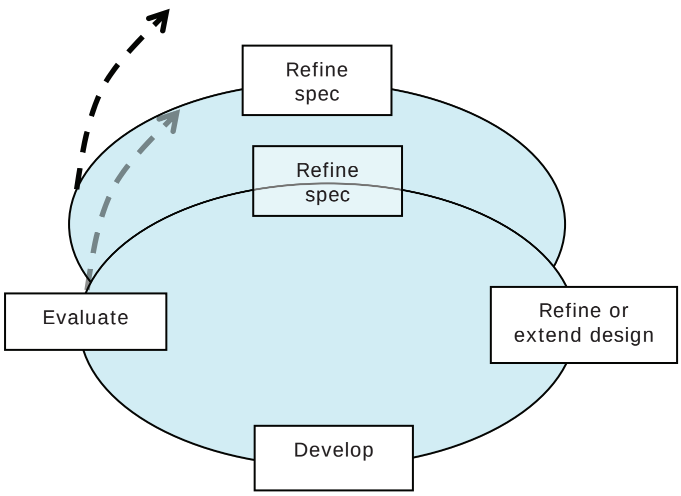

Figure 4: Intense iterative development

A proposed advantage of the 'agile' approach is a more rapid development of usable resources and systems. However, a possible danger is not maintaining time discipline. In order to do this, techniques such as 'time boxing' may be used (Stapleton, 1997). This technique specifies setting out the targets outputs for a given time period. Crucially, however, these targets are clearly prioritised. In developing a set of learning objects the team thus have to prioritise which are the more important. As the learning objects are self-contained the failure to produce a full set is much less damaging than the failure to complete a whole system. Those learning objects that have been developed can be used, and those that remain can be deferred to a later cycle. However, even with this flexibility it is important to make sure that a sufficient group of learning objects are produced to meet the learning needs of the tutor in the target implementation.

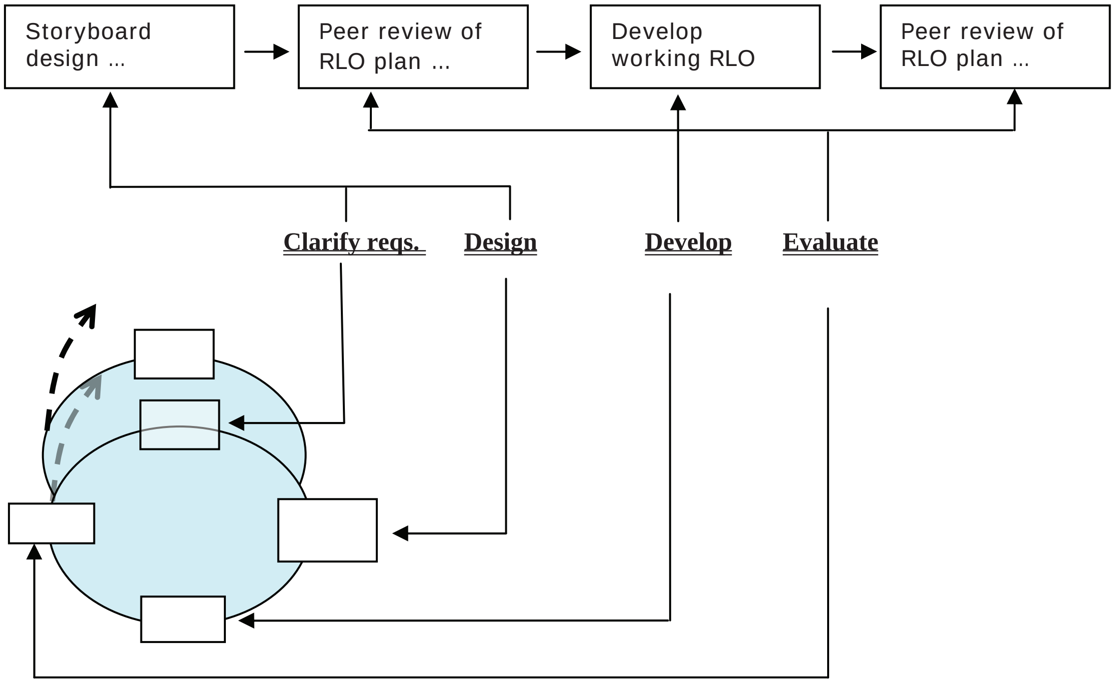

Figure 5: How development functions relate to structures

The CETL supports both modes of development. The choice of mode will depend on the circumstances of the tutor, and in particular, the geographical relationship with the multimedia developer. The relationship of the development paths to the central development functions is illustrated in Figure 5.

Delivery and evaluation: "Use before reuse"

Each new batch of learning objects is normally subjected to prolonged use and evaluation with students. The learning objects are incorporated as part of the students' normal course, and field evaluation data is collected on the students' use and views of the learning objects. The students will normally use the learning objects over a period of weeks. This period may range from one week to a full term/semester.

The learning objects are evaluated against the requirements elicited in the analysis phase. The basic evaluative framework thus needs to be thought out at this early stage. The means of evaluation used should be appropriate to these aims, rigorous and yet feasible to implement. The information should be formally recorded and be available to be included in the learning object metadata.

The evaluation is concerned with the extent and pattern of the students' use of the learning objects, their assessment of the learning objects, and evidence for the pedagogical effectiveness of the learning objects. The evaluation regime may use one or more of the following techniques:

- online tracking of the students use of the learning objects
- direct observation of the use of the objects, for example, in laboratory sessions
- questionnaires to elicit the views of the full student cohort
- detailed qualitative student feedback through interviews and/or focus groups
- measures of improved student performance in, for example, class tests.

Questionnaires can provide a broad survey of student views. The CETL has developed common questionnaires so that student reactions across different institutions can be compared. The information supplied by questionnaires, however, may not provide in-depth information on student problems. Observation provides rich, direct qualitative information. This can arise naturally from interaction with the students in laboratory sessions where the learning objects are used. Interviews and focus groups provide rich, qualitative information where particular issues can be explored in depth. They can be subject to a social facilitation effect, but handled carefully, they can provide important insights into the students' views of the main issues and problems. The RLO CETL has developed a full toolset to support evaluation.

The evaluation data for each batch of learning objects is incorporated in a report to the Local Academic Co-ordinators, and through them to the CETL Management Committee. The CETL encourages the authors of these reports to consider them for external publication. By the end of this phase the learning objects are ready for packaging and storage in the main CETL learning object repository; this is open for external searching, downloading and reuse of the learning objects.

Technical standardisation for storage and retrieval

The CETL learning objects are packaged and have metadata added, following the international specifications and standards established by the IMS and IEEE. The RELOAD tool is normally used for the packaging of the files into an IMS conformant zip file (RELOAD, 2006). The objects are then deposited in the CETL Learning Object Management System, which is built on the commercial Intralibrary system (Intrallect, 2005). The learning objects will then be available for downloading to individual sites, nationally or internationally, from the central repository. As the CETL grows, this will become increasingly important as the central source which holds, and enables the distribution of, the learning objects developed by the CETL.

Summary

The idea of learning objects has had a widespread impact. However, the technical answers supplied by the standardisation community do not address many of the central concerns of tutors. There is a need to develop methods that support the development of high quality learning objects. The paper addresses this issue by presenting the development methodology of the CETL for Reusable Learning Objects. This methodology follows the philosophy of the Agile movement in supporting small dynamic, creative teams. It provides a flexible, structured framework for these collaborative teams to develop high quality learning objects. The methodology has evolved from and is grounded in successful practice. It emphasises starting with understanding the problem and then designing, using and evaluating learning objects to tackle this problem. This method complements the design heuristics articulated in previous work, where learning objects are viewed not as inert content but rather as virtual micro-contexts for learning. The design of these contexts should embody rich pedagogy with structural properties such as cohesion and decoupling to support reuse (e.g. Boyle, 2003). The CETL methodology, used with this design guidance, supplies a powerful, user-centred framework for learning object development.

References

Agile Manifesto (2001). *Manifesto for Agile Software Development.* http://agilemanifesto.org/ [viewed 5 October 2006]

Boyle, T. (2003). Design principles for authoring dynamic, reusable learning objects. *Australian Journal of Educational Technology,* 19(1), 46–58. http://www.ascilite.org.au/ajet/ajet19/boyle.html

Bradley C. & Boyle T. (2004). The design, development and use of multimedia learning objects. *Journal of Educational Multimedia and Hypermedia, Special Edition on Learning Objects*, 13(4), 371–389.

Cook, J., Leeder, D. , Wharrad H. Morales, R. & Boyle, T. (2004). *The Student Voice on Enhancing Learning Through the Reusable Learning Objects CETL.* Presented at The Higher Education Academy Annual Conference, 29 June–1 July 2005, Edinburgh.

EASA (2004). European Academic Software Awards. http://www.bth.se/llab/easa.nsf/ [viewed 5 September 2005]

IEEE (2002). *Draft Standard for Learning Object Metadata.* http://ltsc.ieee.org/wg12/files/LOM_1484_12_1_v1_Final_Draft.pdf [viewed 13 January 2005]
IMS (2005). IMS Global Learning Consortium. http://www.imsglobal.org/ [viewed 5 October 2006]
Intrallect (2005*). Intrallect.* http://www.intrallect.com/ [viewed 5 October 2006]
Learning Objects for Programming (2004). http://www.londonmet.ac.uk/ltri/learningobjects/list.htm [viewed 5 October 2006]
Leeder, D., McLachlan, J., Rodrigues, V., Stephens, N., Wharrad, H. & McElduff, P. (2004). Universities' Collaboration in eLearning (UCeL): a virtual community of practice in health professional education. In Kommers, P., Isaias, P. & Nunes M. B. (Eds) *IADIS Web-based communities 2004*, IADIS Press 2004 Available: http://www.ucel.ac.uk/documents/docs/IADIS_UCeL_final_79.doc
RLO-CETL (2006). *Reusable Learning Objects Centre for Excellence in Teaching and Learning.* http://www.rlo-cetl.ac.uk [viewed 6 November 2006]
RELOAD (2006). *Web site for RELOAD tool.* http://www.reload.ac.uk/ [viewed 5 October 2006]
SCORM (2004). *ADL SCORM.* http://www.adlnet.org/scorm/index.cfm [viewed 5 October 2006]
Stapleton J. (1997). *Dynamic Systems Development Method*. Addison-Wesley.
SONET (2006). *Web site of the School of Nursing Educational Technology Group (SONET) at Nottingham University.* http://www.nottingham.ac.uk/nursing/sonet/rlos/ [viewed 5 October 2006]
Yeomans P. (2000). The applicability of Dynamic Systems Development Method to the field of multimedia development. Unpublished M.Phil. thesis, Manchester Metropolitan University, August 2000.

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Recorded lectures: Looking to the future

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Monash University's Faculty of Law has been providing undergraduate students with audio tapes of lectures for many years. Traditionally students would borrow the audio tape and listen to it within the Library. In 1999 the University Library began investing in digital recording technology enabling selected lectures to be made available to students via streaming servers. By Semester 1 2006, 64 undergraduate law classes were being taped, with some classes registering over 7000 hits for the semester. Student expectations of and reliance on these online lectures has steadily grown, with teachers facing increasing pressure to tape their lectures. This pressure is now expanding to demands for more flexible methods of access to the lectures.

This paper looks at the development of recorded lectures at Monash University, with a particular emphasis on the experience of the Faculty of Law. Teacher concerns regarding the provision of recorded lectures and the potential implications for other teachers and units in the faculty of a Semester 2 trial of podcast lectures is discussed.

Keywords: online learning, learning on demand, recorded lectures, podcasting

History of lecture recording at Monash University

Monash University has been providing students with access to taped copies of their lectures, via the Library's Taped Lecture Service (TLS), since the 1970s. The initial service allowed students to borrow tape recorded lectures anywhere between 4 and 24 hours after the completion of the recording, and to listen to them within dedicated listening rooms within the library. The service, which was labour intensive in the collection and processing of the tapes, quickly developed in popularity among students with language difficulties, domestic and work commitments, and with students who preferred the taped format (Harrison & Binns, 2000).

In 1997–1998 the Library conducted a pilot project to determine the feasibility and cost of remote digital recording of lectures and providing them to students via the web (Harrison & Binns, 2000). The success of the pilot project led to the implementation in 1999 of the Monash Lectures Online (MLO) service. The MLO service automatically records the live lecture, delivers the lectures across the University network to a RealAudio server. Students can access the streamed lecture via the Internet within 3 minutes of the completion of the recording (Harrison & Binns, 2000). In 2004 extra funding was provided to "upgrade, expand and enhance the MLO services" and to upgrade lecture theatre technology (Burke, 2004).

Online lectures: The Faculty of Law perspective

The MLO system has been used within the Faculty of Law since the system was officially launched in 1999. Statistics available at that time showed that law recordings represented approximately 64% of all streams (lectures played for longer than five minutes) accessed. Law students have consistently reported satisfaction with the service, with continuous requests, made by individuals and through the Law Students Society, for an increase in the number of lectures being taped. Over the previous seven years, usage of the MLO service within the Law Faculty has steadily grown with 64 undergraduate lecture streams being taped in semester 1 2006.

As the availability of online audio recording of lectures has grown, so too has the provision of an electronic version of the lecture overheads/slides used in the face to face lecture. A semester 1 2006 survey (unpublished) of Law Faculty students showed that students perceive the availability of the slides to be of benefit to them, particularly where they are made available before the relevant lecture or its recording is available. The importance of this dual approach of audio and visual modes for enhanced student learning is supported by the literature as discussed by Williams and Fardon (2005). Students take notes directly in or on the relevant slides during the lecture, or when listening to the audio recording. A delay in providing the slides has sometimes been a cause of student complaints reported by teachers, and also featured in the comments received in the survey.

Much of the online learning support provided to law students has been a result of teacher innovation, perceptions of student needs, or direct student feedback and requests, with minimal formalised research undertaken to determine the real student needs or desires. The semester 1 2006 survey (unpublished) of Law students was an attempt to redress this lack. It was conducted to investigate student perceptions of the importance of online material provided by the Faculty and their use of the material, with a view to maximising the efficiency of the resources devoted by the Faculty to their provision. Students were asked to rate how valuable the online materials, including lecture slides and the MLO service, were to their studies. Of the 299 respondents, 83% rated the MLO service and 89% rated the lecture slide provision as either valuable, very valuable or extremely valuable. The comments provided by students support these figures, with a number of students advocating the use of the two resources together.

Anecdotal feedback by students and the Law Students Society reported over time has always been supportive and encouraging of the MLO service. Feedback from the 2006 survey confirmed these reports, with comments such as the service is "…very important and essential", is "provided in a very efficient and useful manner", and the service "gives students more subject choice and timetable flexibility".

Amongst the positive feedback received by students complaints regarding the service have also been recorded, both anecdotally and from the survey. These complaints include frustration with human error on the part of the teacher incorrectly operating the lapel microphones, student perception of the low number of lectures taped, and the inability to save the lecture streams. Suggestions for improving the service provided in the survey included provision of video stream, RSS feeds, and the ability to save the online lectures. These suggestions only echo the increasing calls by students across the University to enable them to save a copy of the lecture recording, rather than forcing them to listen while online.

Podcasting would seem to be a solution to meet these requests, given that a podcast solution would naturally include a straight download format as well. This demand may only be the taste of things to come if Mayer (2006) is correct in his prediction that by 2011 American law students will be, in part, basing their choice of law school on the availability of podcast lectures. If these predictions can be mirrored in the Australian context, adoption of podcast lectures may become an act of competitive necessity. Already other Australian law schools, including The University of Melbourne, Deakin University and the University of New England, are utilising podcasting as a means of lecture delivery or supplementation.

Moving to podcasting?

The Monash University Library is conducting a trial of download and podcast lecture recordings in semester 2, 2006. The trial involves between 6 and 12 units across the University, including one undergraduate law. The recorded lectures will be available as a RealAudio stream, an MP3 download, and via podcast. The lecture theatre technology and the experience for the teacher in recording the lecture are unchanged, an approach supported by Fardon and Ludewig (2000). However unlike the current MLO service, the trial will involve some manual handling within the Library. It is anticipated that a successful outcome of the trial would see the manual handling eliminated and the podcasting service scaled up.

Lecturer concerns

Since the implementation of the MLO service, some teachers within the Faculty of Law have been resistant to the provision of recorded lectures via the web. Some of the reasons given include: the belief that the recordings discourage student attendance at lectures; intellectual property concerns of the lecture content; concern that students waste time re-listening to rather than engaging in other learning activities; and concerns lecture content could be used as the basis of claims for libel or defamation. The notion of providing a permanent, personal copy of a lecture, as would be the case with the podcast/download format, is a further concern, as is the potential for students to redistribute them.

Some of these concerns
The literature suggests that some of these concerns are not restricted to Faculty of Law staff. For example Stevenson (2005) and Cowen (2005) report reduced student attendance at lectures as a concern. Cowen (2005) notes an increased self consciousness of lecturers, and the intellectual property of the lecture content is mentioned by Knight (2006), Cowen (2005) and Neville & Fardon (2003).

Teachers within the Faculty of Law have reported that student attendance at lectures dropped, quoting enrolments of 87 and 150 each and attendance at approximately 30 and 80 respectively. In the first of these units the teacher stated in the recording that if attendance dropped below 20 the recording would be discontinued. Students who had listened to the recording in place of attending the lecture subsequently contacted the teacher with explanations for their non attendance. So in some units at least, it would appear that the MLO service is being used by students in place of lecture attendance, however it is not clear if attendance would have increased if the recordings were not available.

To address teacher concerns, the Faculty of Law drafted a statement regarding the provision of online resources and the responsibilities of students (Faculty of Law, 2005). The statement referred to the Monash University ‘Codes of Practice for Teaching and Learning’, which states: “Students … have the following responsibilities: - for on-campus students, to attend lectures” (Monash University, 2005). It then stated the Faculty’s position that the lecture recordings are provided to “supplement rather than substitute for regular class attendance”, that the “provision of taped lectures in units or particular unit streams is made available at the discretion of the lecturer”, and that “Students should refrain from asking lecturers to provide taping of lectures or additional teaching materials on-line.”

This experience regarding reduced student attendance at lectures is contrary to the results reported by the CALI Legal Education Podcasting Project (LEPP), in which 30 law teachers volunteered to record and podcast their entire lectures or summarised version thereof. The LEPP project found that 80.8% of students reported their attendance at “podcast classes’ was similar to their attendance at other classes (Mayer, 2006). Further, only 12.8% of students said they did not attend lectures because they knew that the podcast was accessible. Neville and Fardon (2003) and Williams and Fardon (2005) report that at the University of Western Australia attendance at lectures appeared not to have been greatly impacted by the provision of lectures online, and similar results were also reported by Brotherton and Abowd (2004). A survey of teaching staff who utilised web based lecture recordings at Melbourne University (2004) reported mixed experiences regarding student attendance.

While not specifically tested, in his comments Mayer (2006) suggests that in some cases students’ non attendance at lectures would have occurred regardless of the availability of the podcast, and that its availability served to reassure these students that they would not miss out on the information presented in lectures. Similar anecdotal findings were reported by Williams and Fardon (2005), and Albon (2004) noted that students perceived the flexibility of not having to attend classes was perceived by students as “quality learning”.

Where to from here?

The tension that exists between the student expectation of the ML service and the concerns expressed by the teachers is an issue that needs further attention. As such, the Faculty of Law is asking students to complete a survey about their attendance and non attendance on campus and their use of recorded lectures. The survey will attempt to draw a profile of student use of the MLO service, and investigate the existence of a relationship between lecture attendance and use of the MLO service. The literature (including media reports) indicates that provision of recorded lectures has produced the following benefits: allowing students to catch up on missed classes (Albon, 2004; Frey, 2005; Mayer, 2006; Willams & Fardon, 2005), supplementing the notes students take in lectures (Frey, 2005; Knight, 2006; Mayer, 2006), facilitating examination review (Frey, 2005; Mayer, 2006; University of Melbourne, 2004; Willams & Fardon, 2005), and enabling students to review difficult concepts as required (Albon, 2004; Knight, 2006; Mayer, 2006; University of Melbourne, 2004; Willams & Fardon, 2005). The survey will attempt to verify the existence of these benefits for law students at Monash University. The survey results will be presented to the Faculty of Law’s Information Technology Advisory Committee for further consideration.

References

BBC News. (2006). http://news.bbc.co.uk/2/hi/uk_news/england/west_yorkshire/5013194.stm [viewed, 1 Aug. 2006].

Albon, R. (2004). "ilectures: Their current role in learning", HERDSA Conference, 2004.

Burke, J. (2004). Expansion of Monash University Lectures Online Project Charter, Monash University

Cowen, T. (2005). Should professors podcast their lectures on-line? http://www.marginalrevolution.com/marginalrevolution/2005/10/should_professo.html [viewed 1 Aug. 2006].

Faculty of Law (2006). Importance and Use of Online Resources, unpublished internal survey report.

Faculty of Law (2005). On-Campus Law Students - Policy On Provision Of On-Line Teaching Materials, http://www.law.monash.edu.au/policies/on-line-teaching-materials.html [viewed 1 Aug. 2006].

Fardon, M., & Ludewig, A. (2000). "iLectures: A Catalyst For Teaching And Learning?", Published in R. Sims et al., (Eds). Learning to Choose ~ Choosing to Learn: proceedings of ASCILITE 2000. Coffs Harbour, Southern Cross University, pp.45-56.

Frey, C. (2005). UW's downloadable lectures have iPods playing a new tune, Seattle Post-Intelligencer http://seattlepi.nwsource.com/local/246542_uwpod31.html [viewed 1 Aug. 2006].

Harrison, A. & Binns, G. (2000). Monash Lectures Online: cost effective flexible delivery. VALA Biennial Conference and Exhibition (10^{th}: Melbourne: 2000) Conference proceedings.

Knight, R. (2006). Podcast pedagogy divides opinion at US universities, FT.com, http://www.ft.com/cms/s/904272e4-9997-11da-a8c3-0000779e2340.html [viewed 1 Aug. 2006].

Mayer, J.P. (2006). Education Podcast Commons, Measuring Teaching Effectiveness and the Wisdom of Crowds, CALIopolis, http://caliopolis.classcaster.org/blog/legal_education_podcasting_project [viewed 1 Aug. 2006].

Mayer, J.P. (2006). Legal Education Podcasting Project – End of Semester Survey Results, CALIopolis, http://caliopolis.classcaster.org/blog/legal_education_podcasting_project/2006/07/05/leppsurvey [viewed 1 Aug. 2006].

Monash University (2005). “Codes of Practice for Teaching and Learning”, http://www.adm.monash.edu.au/execserv/policies/Academic-Policies/policy/codes-of-practice-for-teaching-and-learning.html [viewed 3 Oct. 2006].

Neville, M., & Fardon, M. (2003). "Case Study: Stages in establishing a large scale streaming media implementation – an institutional perspective", Presented at Educause 2003. Adelaide, University of Adelaide

Stevenson, A. (2005). Empty lecture halls in the online campus. Sydney Morning Herald. http://www.smh.com.au/news/National/Empty-lecture-halls-in-the-online-campus/2005/02/25/1109180113568.html, Feb. 26, 2005, [viewed Aug. 1 2006].

University of Melbourne (2004). Assessment of the iLecture Service in 2004: Staff survey responses, http://www.infodiv.unimelb.edu.au/tss/enhance/docs/05-06-03-ilec_staff_survey.pdf [viewed 2 Aug. 2006].

Williams, J., & Fardon, M. (2005). "On-demand internet-transmitted lecture recordings: attempting to enhance and support the lecture experience", presented at ALT-C, September 2005.

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Teaching with technology: Using online chat to promote effective in-class discussions

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Much has been written about the role discussions can play in creating an effective learning environment. However, the difficulties in conducting an in-class discussion in which all students have the opportunity to take part in a meaningful way are well recognised. It may be difficult for a student to feel his/her contribution is integral to the discussion if they are one of 20; shy students are rarely heard from, and controversial content may not attract adequate student contributions. Is it possible for the tutor moderating the discussion to determine those students who are finding the concepts under discussion difficult to understand? Does the opinion of the tutor influence the nature of students' responses? In-class discussions have been used in tutorials in School of Education courses at Macquarie University to study the set course readings but the course tutors were not convinced of their effectiveness. As firm believers in the value of discussion, the tutors had to find another way to enable everyone to have a voice. This paper reports on the in-class online chat assessment task currently being offered. These discussions successfully encouraged all students to become involved and the students' understanding and engagement with course material improved dramatically.

Keywords: computer-mediated communication, learning communities, collaborative learning, teaching and learning strategies, technologies for marginalised and disadvantaged

Introduction

For a number of years, in-class discussions have been used in tutorials in the School of Education to study the set course readings; but the course tutors were not convinced of their effectiveness, particularly when it was discovered that in any tutorial group of 20 students, only 4–6 students contributed regularly throughout the class discussion. Some others occasionally made a comment but the remainder (the majority) did not actively participate. Attempts by the tutors to include 'the silent majority' by directing a question specifically to a non-contributor were often met with an embarrassed silence.

Prior to this study, students have been given direction in the unit outline as to which readings were to be discussed and when. Inevitably when the tutorial discussion began, it became obvious to the tutors that some students who were familiar with the readings did not contribute regularly to the class discussion, while other students had either not done the required readings or had given them a cursory read at best. Clearly this had a serious effect on the quality of the ensuing tutorial discussion. At the end of the unit when the students' examination papers were marked, it emerged that the students had read these articles in preparation for the exam, understood their messages and effectively engaged with them. However, their level of engagement and understanding of both the readings and the course lectures could have been improved had they actively discussed the issues in tutorials throughout the course.

It was decided that assessing the tutorial discussions might encourage students to study the readings as the course progressed, rather than just before the examination period at the end of the course. The students would then have the benefit of this knowledge throughout the course and enhance their understanding of the course lectures. The difficulty of assessing in-class discussion was solved when the tutors became aware of new software being trialled at the university which recorded online discussion. Hence students' contributions could be reviewed at any time and formally assessed, if required.

The success of the first online discussion was immediate and significant. Every student contributed to the discussion and was able to discuss the issues raised with confidence and in depth. When the course tutors commented on the students' enthusiasm for the online discussion activity to the LAMS@Macquarie team who were overseeing the project (http://www.melcoe.mq.edu.au/projects/ LAMS@MQ/index.htm), the team confirmed this observation was not an isolated incident: some of the teachers involved in the LAMS school trials were now incorporating synchronous chat into their own classroom discussions. These classroom teachers believed the online chat overcame many students' reluctance to speak up in class, avoided the discussion being dominated by one or two of their classmates, could accommodate simultaneous small groups and moved the discussion to a more student-centred activity.

The role of discussion in effective learning – the literature

There is a great deal of evidence to support the idea that good quality discussions can help students learn. In fact, discussion is the basis of social learning theory. Vygotsky (1978) emphasises students learn from each other's scholarship, skills and experiences and stresses that learning is more than the accumulation of facts: it includes social interaction and socially constructed discourse (McLoughlin & Oliver, 1998). Speech organises, unifies and integrates many disparate aspects of student behaviour such as perception, memory and problem solving (Vygotsky, 1978). Debates with their peers serve to effectively highlight alternatives to the student's own point of view. As the resulting conflicts of opinion demand resolution, the students involved are prompted toward higher-level solutions (Piaget, 1932). Discussion exposes students to multiple perspectives and encourages them to build their own knowledge of the subject matter (Larson, 2000). The result is a more in-depth learning about a topic, and it helps students understand the subject matter more clearly because the process of discussion clarifies their thinking.

Wittgenstein believed that "understanding grows as discussion grows" (Wittgenstein, as quoted in Rhees, 1998) and that students develop and clarify ideas in discussion. We are social creatures who simply enjoy talking to each other and when it comes to learning, discussion can be a very valuable tool (Jonassen, 1999). When students own the knowledge, rather than that ownership resting with the tutor or the textbook, they become committed to building knowledge, rather than merely receiving and reprocessing it. It is clear that discussion-based teaching methods are very effective for obtaining higher-order thinking in students because the students are actively engaged in the process. The creation of a learning environment that enables students to hear a variety of points of view and express and explore their own views, supports them in formulating their own opinions and allows them to apply their knowledge to problem-solving (Brookfield & Preskill, 1999).

Like the tutors in the study, Kanuka & Anderson (1998) believe online discussion tools can be used to advantage with discussions. The online discussion forum represents a learning environment in which group collaboration is practiced in a technologically mediated environment. McLoughlin & Luca (2000) agree collaborative learning tools offer some unique opportunities both for peer and electronic support for higher-order thinking, and online forums and provide opportunities for student dialogue that stimulate interchange of ideas and reflective processes. However, any euphoria about the effectiveness discussions should be tempered by the body of research reporting online discussions typically suffer from low participation rates, varying degrees of disappointing collaboration and low learning performances in terms of quality of learning and student satisfaction in online environments (Kreijns, Kirschner & Jochems, 2002; Ho, 2002; Laurillard, 2002; Garrison, Anderson & Archer, 2000; Kanuka & Anderson, 1998). These reports of disappointing outcomes when using online discussions contrast markedly with this study's findings.

Background

Three online discussions were implemented in the course: two of which were to become part of the assessment schedule. A feature of the online discussion trial was that it allowed simultaneous small group discussions. This provided students with a much greater opportunity to contribute than the 20:1 ratio of previous in-class discussions. With five group discussions operating at once, the tutor's normal role of discussion director was gone. Although the software allows the tutor to monitor what each group is doing via a computer screen, the 'mantle of control' is passed to the students themselves.

The decision as to whether to have synchronous or asynchronous online discussions arose. Whereas an asynchronous environment would encourage higher-order thinking, giving our students time to reflect and consider before responding, a synchronous discussion had the advantage of spontaneity and immediacy of response that also held appeal to the tutors. A combination of both was trialled: An initial synchronous discussion in a computer laboratory where students could have their first experience of the software under the guidance of a tutor; followed some weeks later with an asynchronous discussion over run over 10 days, and finally a synchronous discussion held under exam conditions at the end of the course.

Method

To determine whether the quality of in-class discussions could be improved by introducing assessment, a pilot study was begun in 2005, with 94 second year Education students (28 male and 66 female). One in-class discussion was recorded of each group and the transcripts compared with transcripts of one asynchronous on-line discussion and one synchronous in-class online discussion of each group. Each student's participation to the discussions was analysed for the number of contributions, evidence of higher-order thinking, substantive communication and off-task claims. These results were then compared for each of the discussions. Three focus groups were also arranged to discuss the students' experience.

Discussion

It was the quality of the online discussions that convinced the tutors that this trial was a resounding success. The level of engagement with the readings and their enthusiasm for the topics when they were confident of the material was inspiring. A growth in the students' level of understanding was often witnessed during a discussion and many times a student's firm stance on a topic swayed after a healthy online debate with fellow students. Unsurprisingly, the quality and length of the postings were greater in the asynchronous discussions, but these lacked the coherence and fervent argument of the synchronous discussions. Both were successful in their own way and in the upcoming semester both will be used again. When students' reflected on their own learning, their responses to the online discussions were mixed. In one of the synchronous discussions, a student wrote:

> Intensive writing is really good for learning … how much are we all writing at the moment, synthesising thoughts and having a great intensive interactive discussion!!! This is a good example, we have time to listen to each other and respond with hopefully well considered comments.

However, in the same session, another student wrote:

> I think this forum just goes to show how superficial online learning can be. It's poisoning my experience of this assessment.

The latter student also stated later, in a focus group, she found the whole exercise quite confronting – she was not comfortable with technology and yet her responses were of a very high standard and she did well in the assignment.

The students in the trial ranged in age from 17 to 68 years and each student brought with them a variety of academic learning, life experience and culture. In face-to-face class discussions, the student's identity often determined how their contributions were interpreted by other students. The software used allowed the tutors to see each student's identity throughout the discussion but their names were not visible to other discussion group members. When comments simply appeared as text on a screen, discussion contributions were taken on their own merit. The resultant anonymity of the online chat was particularly helpful in encouraging an acceptance of all students' views. The online Chat also gave our quiet and shy students added confidence. As one student commented:

> Thank you for giving me a voice in this course. It is so great to have my thoughts heard. I am usually the quiet one sitting at the back of the class. By the time I have thought about what I want to say, someone else has already said it, or the conversation has moved on. Thanks again for giving the silent majority a go.

With the emphasis on verbal face-to-face discussion in this course in previous years, the tutors had an on-going concern that students of non-English speaking backgrounds (NESB) were being disadvantaged. The move to written discussions made participation in class discussion easier for some of these students:

> I do not speak English well. I learnt English from a book. But in this class I can write what I think without worrying about how I sound.

Clearly, in-class discussions will always be more difficult for NESB students regardless of the medium, but many of these students performed more confidently when they could read other student's comments and take their time to reply.

Conclusion

The online discussion assessments held in this course led to a deeper understanding of the set readings and improved engagement with their content. Their use overcame many students' reluctance to join in the classroom discussions and avoided them being dominated by a small number of their peers. The use of the technology meant the discussion could accommodate simultaneous small groups and moved the discussion to a more student-centred activity. The quality of this cohort's work throughout the course confirmed the use of the online discussions facilitated student understanding and engagement of the course material.

There are several factors that may explain this result. The tasks were assessable, which is always a powerful motivator with students; the software used for the online discussions was easy for students to use and most were keen to take part in the online class discussions (novelty value?); students did not need to be assertive to contribute to the discussion; it was more obvious in the small group environment when students were not familiar with the readings and the small groups gave students ample opportunity to speak up. Further research is planned to determine how each of these factors may have influenced these in-class online discussions.

References

Brookfield, S. & Preskill, S. (1999). *Discussion as a way of teaching: tools and techniques for university*. Buckingham: Open University Press.

Garrison, D.R., Anderson, T. & Archer, W. (2000) Critical inquiry in a text-based environment: computer conferencing in higher education. *The Internet and Higher Education*, 2(2–3): 87–105.

Ho, S. (2002) Encouraging on-line participation? TL Forum (2002). *Focusing on the Student. Proceedings of the 11th Annual Teaching Learning Forum*, 5–6 February 2002. Perth: Edith Cowan University.

Jonassen, D.H. (2000). *Computers as mindtools for schools: Engaging critical thinking.* Upper Saddle River, N.J.: Merrill.

Jonassen, D.H. (1999). *Learning with technology: A constructivist perspective.* Upper Saddle River, N.J.: Merrill.

Kanuka, H. & Anderson, T. (1998). Online social interchange, discord, and knowledge construction. *Journal of Distance Education*, 13(1), 57–74.

Kreijns, K., Kirschner, P.A. & Jochems, W. (2002). The sociability of computer-supported collaborative learning environments. *Educational Technology & Society*, 5(1), 1–19.

Larson, B.E. (2000). Classroom discussion: A method of instructions and a curriculum outcome. *Teaching and Tutor Education*, 16, 661–667.

Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies*. 2nd ed. London: Routledge Falmer.

McLoughlin, C. & Luca, J. (2000). Cognitive engagement and higher order thinking through computer conferencing: We know why but do we know how? *Flexible futures in tertiary teaching. Proceedings of the 9th Annual Teaching Learning Forum*, 2–4 February.

McLoughlin, C. & Oliver, R. (1998). Scaffolding higher order thinking in a telelearning environment. In T. Ottman and I. Tomek (Eds), *Proceedings of Ed-Media/Ed-telecom 98 World Conference on Educational Multmedia and Hypermedia*, 977–983. Charlottesville, VA.

Piaget, J. (1932). *The moral judgment of the child.* London: Kegan Paul, Trench, Trubner.

Rhees, R. (1998). *Wittgenstein and the possibility of discourse.* Cambridge: Cambridge University Press.

Vygotsky, L.S. (1978). *Mind in society: the development of higher psychological processes.* Cambridge: Harvard University Press.

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Everyone's learning with podcasting: A Charles Sturt University experience

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The authors have been involved in a year long project in which a group of second year undergraduate students is placed in charge of producing a series of educational podcasts targeted towards other students undertaking a number of information technology subjects. The exercise has proved to be a valuable learning experience for all those involved: the listeners, the producers and the educators. This paper describes the authors' ongoing efforts and discusses the impact of the activities on each of the groups involved. It concludes with suggestions for other educators interested undertaking similar efforts, which may contribute to best practice as the field of educational podcasting continues to develop and evolve.

Keywords: educational podcasting, MP3, mobile learning, peer teaching, learning by teaching

Introduction

Podcasting technology allows audio content from one or more pre-selected feeds (channels) to be automatically downloaded to one's computer as it becomes available, then later transferred to various types of companion media such as iPods and MP3-capable mobile phones, for listening to at a convenient time and place, or "on the move". Because these media forms do not rely on the visual senses, they allow learners to carry out other tasks while listening. Additionally, these devices have a high level of social cachet, particularly with younger students. There has been significant recent uptake of MP3 players and podcasting, both in mainstream society and in higher education.

The authors' educational podcasting efforts began with an attempt to use pre-class listening material as a means to address the preconceptions and anxiety that students bring into the classroom in a first year undergraduate information technology subject at Charles Sturt University (CSU) (Chan & Lee, 2005). The project has since expanded substantially to include the production and distribution of podcasts for other subjects, involving both undergraduate and postgraduate students, studying at other CSU campuses as well as off-campus in various locations around Australia and overseas.

The present paper begins with a discussion of podcasting and its educational applications, and briefly showcases some of the authors' work in this area. It then considers, in turn, the impact on the various parties involved: the listeners, the producers and the educators, before providing suggestions for tertiary teachers interested undertaking similar efforts.

Audio in teaching and learning

Audio has traditionally been neglected and underused as a teaching and learning medium (Bates, 1981; Romero-Gwynn & Marshall, 1990; Scottish Council for Educational Technology, 1994). Perhaps this may be attributed to the popular view that "[listening to audio is] not learning…[as this] is not synonymous with comprehension and action" (Clark & Walsh, 2004, p. 25). However, Durbridge (1984) emphasises the educational advantages of audio over printed media: "As compared with a written text, the spoken word can influence both cognition (adding clarity and meaning) and motivation (by conveying directly a sense of the person creating those words)." Power (1990) concurs: "The ability to adjust or modulate [the] frequencies [of the human voice] allows us to communicate in a correct and artistic way with words and sounds…[T]he ability to adjust intonation, inflexion, phrasing, pacing, volume, loudness and timbre [distinguish speech from print]." (sec. 2.1, para. 1). He points out that "spoken words through heightened intonations or subtle nuances can communicate...emotions and create a sense of intimacy at the same time"; on the other hand, "[p]rint does not allow a learner to identify or interpret audible nuances that personalize content…" (sec. 2.1, para. 2).

Sophisticated multimedia elements like video, animation and interactive media have a high success rate in terms of boosting attention, motivation and interest, but are expensive and time consuming to develop. If well-designed, they may be optimised for reuse from semester to semester, but are difficult to create or modify mid-semester to suit the needs of a particular cohort. By contrast, digital audio is cheap and simple to produce and manipulate, due to the availability of basic sound recording and playback hardware and software in homes and educational institutions. More importantly, unlike other media forms, audio liberates learners from the tyranny of the screen and "frees eyes and hands" (Clark & Walsh, 2004, p. 8) so learning can coincide with other activities rather than replacing them, thus paving the way for true mobile learning.

Radio has been used in education ever since it became available (World Bank, 2000). Audio cassette tapes and more recently CDs have been used as a solution where the ephemeral nature and fixed transmission times characteristic of radio broadcasts (World Bank, 2000) pose a problem, where the audience is geographically dispersed over too large an area, or where radio air time is simply not readily available. Learners see cassettes as more personal and informal than radio, and cassettes have also been found to be more appropriate for controlled, didactic teaching (Bates, 1981). Podcasting may offer the best of both worlds by combining the benefits of the broadcast nature of radio with the flexibility, learner control and personalisation afforded by recorded audio.

MP3 player ownership and podcasting adoption

The increasing ubiquity of MP3-capable devices in mainstream society is fuelling the growth of podcasting in general, and in particular, educational podcasting. The Pew Internet & American Life Project (Rainie & Madden, 2005) reports that almost one in five (19%) of those aged 18 to 30 own MP3 players, compared to 14% of those aged 30 to 39 and 14% of those aged 40 to 48. Internet usage, level of Internet experience and the availability of broadband access were found to correspond directly to MP3 player ownership. Over 80% of college students in the US own at least one device capable of downloading and playing recordings (Diverse Issues in Higher Education, 2006).

The Pew study also found that 29% or around 6.4 million of the 22 million American adult owners of MP3 players had downloaded podcasts for later listening. A more recent study by Nielsen/NetRatings (Carson, 2006) revealed that 6.6% of the US adult online population (9.2 million users) recently downloaded an audio podcast. Web users between the ages 18 and 24 were almost twice as likely as the average user to download audio podcasts, signalling that adoption should continue to grow.

Overview of podcasting technology

The term "podcasting" is a portmanteau that combines the words "iPod" (Apple's popular portable music player) and "broadcasting". Podcasting differs from simply making media files available for download from a web page, or streaming (playing the media as it downloads), in that it avoids a "click and wait" situation by having a computer that is continuously online so that bandwidth-intensive content can be "dripped in" and made available when ready (Curry, 2004). This is especially useful where high-speed, reliable broadband access is not readily available.

Podcasting is based on Really Simple Syndication (RSS, variously termed Rich Site Summary and RDF Site Summary). RSS-enabled web sites generate a feed of Extensible Markup Language (XML) data summarising the content of the site. This XML is maintained either manually – a process that is simpler than authoring (X)HTML for a web page – or more commonly, generated on-the-fly by server-based software. For example, many weblog and content management systems automatically syndicate RSS. On the client-side, programs called aggregators periodically poll subscribed feeds for updates and deliver new content directly to the user's desktop. Content can be filtered and aggregated from multiple feeds.

Podcasting-capable aggregators or "podcatchers" are used to download podcasts. They are configured to do so by supplying them with the URL of the relevant RSS feed. The podcatcher monitors the feed for

RSS 2.0 (RSS Advisory Board, 2005) <enclosure> elements, which specify the URL of the media file, its size and MIME type. Downloaded files can be transferred to a variety of portable devices, including MP3 players, handheld computers, laptop computers and tablet PCs, as well as many modern mobile phones and personal digital assistants (PDAs). Users without access to such devices can simply listen to the content on their PCs.

Podcasting at CSU: Beyond recorded lectures

There has been significant uptake of portable music players and podcasting in higher education, although there is currently little published academic literature in this area. Since Fall 2002, various courses at Georgia College & State University (2005), including a number of study abroad courses, have been "iPod-enhanced" to include a diverse range of audio material ranging from lectures and audio books to language study material and music. In August 2004, Duke University (2006) distributed 20-gigabyte iPods to its 1,650 commencing students, pre-loaded with orientation information. Administrative and academic materials in MP3 format are available for students to download from the Duke Web server and via Apple iTunes. In a smaller-scale project, Drexel distributed iPod Photo players to its School of Education freshmen in September 2005 (Read, 2005). Apple recently launched iTunes U (Apple Computer, 2005), a free, hosted service for colleges and universities that provides easy access to audio and video content such as lectures, using the same technology as the commercial iTunes Music Store.

Many existing educational uses of podcasting focus on the use of the technology to deliver instructional content such as lectures, which can lead to questions of pedagogical soundness and risk adversely affecting class attendance. Used appropriately, however, podcasting can enhance classroom learning by encouraging students to engage with the material and adding yet another modality of learning (Carson, 2006). The authors believe the true potential of this technology lies in its community-building value, and its use as a vehicle for disseminating learner-generated content. As mentioned earlier, they began their foray into podcasting in the Autumn (February to July) 2005 semester at CSU's School of Information Studies, with an attempt to examine how short audio clips can be used to address the preconceptions and anxiety that students bring into the university classroom (Chan & Lee, 2005). Creating a productive and satisfying learning experience involves actively engaging students and having them take responsibility for their learning (Schunk & Zimmerman, 1998); their pre-conceptions and anxiety act as an up-front impediment to this. In addition, modern teaching and learning methods based on social constructivist theory such as discovery-based learning, problem-based learning and collaborative learning, have a significantly higher probability of success if students come to class already inspired to learn and willing to participate (Ramsden, 2003). The authors believe that pre-class listening material, delivered in a timely fashion via podcasting, can be part of an effective solution to help alleviate these problems, and do so more flexibly and effectively than traditional methods like subject websites and printed handouts.

The podcasting project at CSU now incorporates a myriad of contexts and applications both within and outside the university. The authors' emphasis was not and continues not to be on recording lectures, but instead on producing short, 3 to 5 minute talkback radio-style segments, with students from the current and/or previous cohort holding discussions on pertinent issues related to the subject and its content in a relaxed and informal style. The lecturer and/or other subject matter experts are occasionally brought in as "guests" to offer insight into, or clarification of, the more difficult or complex issues and topics. The material contained in the podcasts is supplementary in nature and not directly examinable, although it was designed to provide background material and expose students to terminology used in the subject, in addition to allaying their concerns about issues such as textbooks and assessment.

Podcast episodes from the various subjects included in the project have included the following:

- "Oops, I missed my first lecture", in which two students converse about what happens in class in Week 1, from both a subject content and an administrative perspective;
- "Right to copy or copyright?" – An interview with the University's copyright coordinator (a qualified lawyer), covering issues such as why students should be concerned about copyright and how they might accidentally infringe on copyright;
- Various "topic trailers" providing a lead-in to and broad overview of each topic to prepare students for the lecture and other learning activities;

- Assignment tips, hints and post-assignment feedback from the lecturer;
- An interview, conducted over Voice-over Internet Protocol (VoIP), with a textbook author based in the United Kingdom.

The scriptwriting, editing and recording process of the podcasts was driven by a group of volunteer students who were not presently enrolled in, or had previously completed, the respective subjects. There was minimal lecturer intervention in the process.

Who's learning from podcasting at CSU?

Various parts of the podcasting project at CSU seek to study the impact of the podcasting efforts on the listeners, producers and educators, and the learning afforded by their participation. Some of the findings in each of these areas are described below.

Listeners

Participants, context and methods
The participants for this part of the study were from a convenience sample comprising both on- and off-campus students enrolled in an undergraduate IT subject, ITC204 User Interface Design and Evaluation, as well as its postgraduate version, ITC504 Interface Usability, in Autumn 2006 at CSU. The total student population size for the two subjects was 55. The two subjects are identical in content, and the students enrolled in both versions were provided with access to the same podcasts, with a new episode released each week or fortnight. At the end of the 13-week semester, e-mail invitations were issued to the students to participate in an online survey, which was advertised as being completely voluntary and anonymous. At this time, a total of nine podcast episodes had been released. A subset of the data collected that is relevant to the present paper is presented below, namely the responses to the questions relating to uptake levels and educational value of the podcasts.

Results and discussion
23 students responded to the survey, representing a 42% response rate. The results of the survey were very encouraging. Uptake of the podcasts was excellent, as can be seen in Table 1. 82% of respondents reported that they had listened to seven or more of the nine available podcasts from start to finish, and many reported that they had listened to episodes multiple times. All respondents had downloaded at least two of the podcasts. In addition, respondents were generally in agreement that the podcasts were of educational value to them, and that they were beneficial to their understanding of the subject content (Table 2). They largely saw listening to the podcasts as a worthwhile activity and would recommend the podcasts to other students studying the subject.

Table 1: Responses to questions of the ITC204/504 end-of-semester podcasting survey that relate to uptake levels (*N*=23)

To date, how many of the 9 available podcasts have you…	**Mean**	**Median**	**Mode**	**Standard deviation**
Q2: Downloaded (whether or not you have listened to them)?	7.91	9.00	9.00	0.70
Q4a: Listened to from start to finish?	7.57	8.00	9.00	0.73
Q4b: Listened to in part only?	1.55	0.00	0.00	2.48
Q4c: Listened to multiple times?	3.05	3.00	3.00	1.18

Table 2: Responses to questions of the ITC204/504 end-of-semester podcasting survey that relate to educational value of the podcasts (*N*=23)

Please rate the following statements using the scale 1=Very strongly disagree, 2=Strongly disagree, 3=Disagree, 4=Neutral, 5=Agree, 6=Strongly agree, 7=Very strongly agree:	**Mean**	**Standard deviation**
Q8b.I find listening to the podcasts educational.	6.04	0.35
Q8m Listening to the podcasts helps clarify and/or enhance my understanding of the subject.	5.87	0.43
Q8r I feel that listening to the podcasts is not a productive use of my time.	2.22	1.01
Q8s I would recommend that other students undertaking this subject listen to the podcasts.	5.95	0.53

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Question 9 of the survey was an open-ended question that asked respondents what knowledge and/or skills they learnt through listening to the podcasts (whether subject-related or otherwise). The responses were categorised and the results are summarised in Table 3.

Table 3: Responses to Question 9 of the ITC204/504 end-of-semester podcasting survey (*N*=23)

Q9: What knowledge and/or skills did you learn through listening to the podcasts (whether subject-related or otherwise)? **Category***	**N**	**%**
Roadmap/direction for study/thinking; general hints/tips; progress check	6	26.09%
Exposure to podcasting technology	2	8.70%
Reinforcement/clarification of subject-related concepts; different mode and style of presentation of the same material	4	17.39%
Assignments – Clarification of requirements, assistance and/or feedback	9	39.13%
Other	1	4.35%
Not answered	7	30.43%

Note. * Categories are not mutually exclusive, i.e. each response may fall into multiple categories.

Many respondents found the podcasts especially useful for clarifying requirements and receiving general feedback in relation to the assignments – In fact issue spoke the loudest in the responses. For example:

> [The podcasts helped clarify] exact details about the assignments, [so that I could] focus my work on…[achieving]…exactly what the lecture[r]…[was]…expecting

Another resounding issue in the responses was that the podcasts were useful in supplementing the other resources, such as the textbook and subject outline, by providing reinforcement and clarification of important concepts. They served as a valuable study tool as they provided guidance and direction to the students, helping them make more efficient use of their time:

> I found that the…[podcasts]…were…[excellent]…in backing up info from the text. Although I can't say the…[podcasts]…allowed me to gain…[knowledge]…on the subject it did back up what I had learned in the text. Much like a phone call to the lecture[r] to see if I was progressing in the right direction.
>
> Bridges the learning gap between our perceptions of what we read and what is actually required…

Producers

The idea of having students as podcast producers fits into the "participation model of learning" (Sfard, 1998), as opposed to the "acquisition" model, whereby learning means becoming part of a community, through participation and contribution of learning resources. Students are creators and producers of knowledge, ideas and artefacts (Collis & Moonen, 2001). Having students from earlier cohorts of a subject teach or impart their knowledge and experiences to new students is consistent with the principles of peer tutoring or teaching (Brown & Campione, 1992; Beasley, 1997). Advocates of peer tutoring assert that it is a valuable exercise for both the tutors as well as the tutees, since it is a cost-effective way to provide academic support to the tutees, but also affords the tutors the experience of "learning by teaching". According to Topping (1996), the mere process of preparing to peer teach may enhance cognitive processing in the tutor, as it promotes attention to and motivation for the task, and calls for the tutor to revisit, re-organise and re-integrate existing knowledge. The act of tutoring itself involves further cognitive challenge as the tutor must simplify, clarify and exemplify.

The authors studied the following in relation to the producers:

- motivation for involvement in the project, given that their participation is not rewarded by remuneration or academic credit;
- benefits realised as a result of participation;

- learning outcomes attained by the producers (both generic skills and subject content);
- lessons learnt by the producers;
- recommendations on how to improve the experience.

Participants, context and methods

In March 2006, the five members of the producers team included three males and two females, aged 18 to 20, who were enrolled in the Bachelor of Information Technology and Bachelor of Business/Bachelor of Information Technology degree courses offered by CSU. These students expressed an interest in participating, following an announcement and brief overview of the project by their lecturer in class. It was made clear from the outset that their participation was strictly voluntary and non-assessable. The group initially met on a weekly basis, which was reduced to a frequency of once a fortnight as the semester progressed and their own study workload increased. The meetings were structured though relaxed, lasting for approximately one and a half hours each.

The producers brought to the group varying levels of knowledge and skill, and different sets of backgrounds and experiences. They were not provided with formal training, but rather were introduced to the script writing, editing and presentation process by means of examples. They gradually developed competence in the various facets of the process through undergoing a number of practice runs, with decreasing levels of guidance and “hand-holding”, as well as through their interactions with one another.

Focus group interviewing was selected as the data collection method to elicit the views and experiences of the producers. A list of questions was developed to help guide the focus group. These questions were not intended to be followed to the letter, but instead were designed to assist the facilitator and participants by acting as a starting point to trigger or prompt discussion, as well as providing a broad focus to keep the conversation relatively on topic:

1 What are the major incentives / sources of motivation driving your interest in the project, especially given the fact that your participation is not rewarded through formal academic credit? Would you have preferred to have your involvement assessed and rewarded formally?
2 How did being involved in the scriptwriting, editing and presentation of the podcasts to support the topics in ITC*XXX* benefit you? What did you learn from a subject content point of view? How about other generic knowledge and skills (e.g. teamwork, interviewing skills, research skills)?
3 What lessons have you learnt from the project, which might form the basis of advice / recommendations for other educators and groups of producers pursuing similar projects?
4 Do you have any further suggestions on how to make this a really good experience for all those involved (producers, lecturers, listeners)?

The data analysis approach used was derived from Berelson’s (1952) content analysis approach. In the case of the present study, the unit of analysis chosen was the sentence or phrase, i.e. sentences in which the producers expressed a view that contained explicit statements of their experience, which were clustered together as themes. A quantitative content analysis approach enabled the researchers to search for verbal indicators of the particular themes and variables as defined by the five aforementioned issues, namely: motivation for participation, benefits of involvement, skills developed, lessons learnt from the experience and suggestions for improvement.

The content analysis was conducted in four steps. A complete transcript was first made from the audio tape recording of the focus group discussions. To ensure anonymity, participants’ real names were replaced with aliases during the transcription process. The next stage was to agree on a protocol for identifying and categorising the target variables, and training coders to use this protocol. In this case, two of the authors undertook the coding task. The transcripts, in the form of text files, were searched for indicators of the above themes, i.e. instances where students expressed a view that was clearly indicative of the variable being investigated. For example, in seeking indicators of motivational reasons for engaging in the podcasting exercise, certain keywords signalled motivational statements:

> I think one of my main incentives, well not so much incentive as more motivation, was to give back to the community and to the students coming along.

These instances were collated, classified and then counted. Following the coding, the coders' decisions were compared to establish interrater reliability. The final stage was to combine the results of the coding process and report on the incidence of the target variables.

Results and discussion
A total of 24 message units were found in the transcripts, relating to the five major variables being investigated. The content of the producers' responses is coded in Table 4, according to the major variables and the subcategories identified.

Table 4: Content features of the producer focus group discussions

Variable	**Subcategories**				**Message unit count**	**%**
Motivation	Community involvement (1)	Enjoy volunteering (1)	Learn podcasting skills (1)	Learning opportunity (1)	4	16.67
Benefits of involvement	Career in IT (1)	Subject matter and IT skills (1)	Learn podcasting skills (1)	Scriptwriting (1)	4	16.67
Skills developed	Research skills (1)	Being critical of others' work (2)	Teamwork (3)	Learning to communicate (2)	8	33.33
Lessons learnt	Need for presentation skills (1)	Importance of scheduling (1)	Awareness of script reading (1)	Editing (1)	4	16.67
Suggestions for improvement	Keep it short and sweet (1)	Target areas of interest to students (1)	Consider ethical issues (1)	Be creative, go beyond lecture content (1)	4	16.67
				Total:	24	100.0

Motivation to participate in the podcasting project as producers was characterised by a number of diverse responses. Motivational factors included desire for community involvement and volunteering, and to contribute to the learning of other students.

In terms of benefits afforded through participation, students reported that these were development of specialist IT and podcasting skills, career development, and scriptwriting.

Participants elaborated on the types of skills they valued most, which were generic rather than specialised in nature. About one third of comments made related to the development of generic attributes such as research skills, teamwork, the ability to critique others' work and learning to communicate. Student elaborations and utterances on these skills were the most salient feature of the transcripts.

Finally, in response to questions asked about what lessons were learnt as a result of their involvement, participants displayed high levels of meta-cognitive skill in being able to identify areas where they had skills deficits, i.e. oral presentation skills, scheduling, script reading and editing. Other findings related to how the experience could be improved, both for the participants themselves and for other students. The participants were aware of the need to keep podcasts short and focused, creative, closely aligned with the interests of listeners and not simply a reiteration of lecture content.

The results showed that the majority of message units (about 31%) were focused on the generic skills that students developed as a result of participating. If the variable "benefits of involvement" were combined with "skills developed", the results would show that 48% of utterances were related to advantages that students experienced as result of their participation. Overall, these results show that student involvement and engagement in the production of content for podcasts was a positive learning experience. The analysis of the focus group discussions demonstrated that producers reflected on the activity and viewed it as a form of experiential learning that yielded positive gains in terms of technical and generic skills.

Educators

This part of the project is very much a work in progress for which more substantive data needs to be collected. The ultimate aim is to develop a set of best practices for the design, development and distribution of the types of educational podcasts described earlier in the present paper. Anecdotally, the educators involved in the project report on having learnt the following through their experience:

- The length of the podcasts must not exceed the attention span of the listener and should therefore be given careful consideration. In this project, the authors have worked on the principle of 3 to 5 minute podcasts as this is roughly the length of a song. Further research must be carried out to ascertain the optimum length for different types of podcasts, and for different target audience groups.
- Choice of topics is of primary importance. Listeners (at least those involved in the project, i.e. university students) appear to value topics that are of an "applied" nature, i.e. that contain information they can take away and immediately use to optimise their study time (even if the concepts presented are theoretical), assist them in completing assignments, solve particular types of problems/exercises, etc. Dry or highly abstract topics may call for additional strategies to keep students engaged.
- Audio podcasts should not be used to convey information or explain concepts that are best presented visually. For example, the producers team abandoned a podcast script idea on XHTML coding because of the difficulty in explaining the intricacies of code aurally.
- The ability to produce high fidelity sound does not appear to be critical to the success of educational podcasts. Students tend to be quite tolerant in this regard, so long as the speech is sufficiently audible and clear. With this in mind, there is no need for sophisticated, studio-grade sound recording/editing hardware and software. To date, the project has relied solely on inexpensive, handheld computer microphones and free/open source software.
- Listeners generally are not concerned if the presenter of a podcast does not have a "radio announcer's voice". This having been said, contrast in pitch between voices can have a bearing on the ease of listening. For example, in a dialogue-based podcast it appears to be preferable to combine one higher pitched (male) and one lower pitched (female) voice.
- Listening to podcasts may not be an ideal method of learning for all groups of learners. For example, although substantive data is not available at this stage, in a postgraduate distance education cohort consisting of mature age, working professionals, the students appeared to favour text-based material in print or electronic (web-based) form. In fact, some even asked for transcripts of the podcasts to be supplied so they could avoid having to listen to them!
- Some students need coaxing to encourage them to create their own podcasts, as many prefer to take on a passive listening role, at least initially. This may be a function of the student's personality.
- In training producers, the technical aspects of podcasting are of secondary importance. The real challenge is in teaching them creativity.
- Using a pseudonym when presenting podcasts in order to keep the producers' real identities secret can remove inhibitions and encourage them to contribute more readily and freely.

The authors would like to make the following recommendations to other educators interested in undertaking similar educational podcasting endeavours:

- Keep podcasts short, lively and entertaining. Refrain from podcasting lengthy lectures/monologues.
- Podcasts should not be thought of as a replacement for classes, but rather as complementary to lectures. For example, pre-class podcasts can be used to whet students' learning appetites so that they come to class excited about the material. Such podcasts can also make for more effective use of class time, since students come to class with some background knowledge on the topic and are therefore better prepared to engage in discussions and collaborative learning activities.
- Refrain from duplicating content that is available elsewhere, such as lecture notes and textbooks, or that will be covered during class. If you must do this, simply summarise salient points and provide additional commentary/insight.
- Don't podcast just for the sake of it: consider its suitability for the subject/topic and target audience.
- Think of ways to use the technology to empower learners to generate their own ideas and content: take a step back and let the students do the thinking/talking!

- Provide adequate technical support so that students can focus their attention on learning, creativity and knowledge construction rather than troubleshooting the technology. Take steps to ensure that the technology does not become a distracter.
- Provide gradually decreasing levels of assistance to students as they learn how to produce their own podcasts. In the early stages you might supply students with a script or script outline to work with as a starting point. As they build experience and confidence, allow them to not only modify the scripts and improvise while presenting, but also to take the initiative to come up with their own ideas and scripts.
- Don't underestimate the importance of sound project management and planning, and emphasise this to your producers.

Conclusion and future work

The educational podcasting project at Charles Sturt University has been a valuable learning experience for the listeners, producers as well as the educators. The listeners responded favourably to the podcasts through their excellent uptake of and positive feedback about the educational value of the podcasts in providing assistance and feedback with their assignments, a roadmap/direction for their study, as well as clarification and reinforcement of key concepts. Placing a group of more experienced students in charge of producing a series of educational podcasts targeted at new or novice students appears to be a beneficial exercise for the producers that exhibits many principles similar to peer teaching.

Further data collection and analysis will need to be undertaken in relation to the educators. While the technology largely has a high level of social cachet amongst the students, who have little or no trouble using it, widespread adoption at an institutional or departmental level may face resistance, or at the very least, apprehension, from academics who may question if podcasting is really worth their time and effort. The authors believe that with the aid of the appropriate tools and resources, podcasting can be easily integrated into the professional practice of all tertiary teachers. They are currently working in partnership with academics from other schools and faculties within CSU, as well as with other institutions at both a university and high school level, to explore innovative new applications for their podcasting model and approach. Work is underway that will see the development of a resources kit incorporating technical guides or "HOWTO's" relating to educational podcasting, as well as a set of best practices for the design, development and distribution of educational podcasts.

References

Apple Computer. (2005). *Apple – Education – iTunes U*. http://www.apple.com/education/solutions/itunes_u/ [viewed 27 Mar 2006].

Bates, A.W. (1981). Radio: The forgotten medium? Studies in the use of radio programming and audio-cassettes in Open University courses. In *Papers on broadcasting*, No. 185. Milton Keynes: Institute of Educational Technology.

Beasley, C.J. (1997). Students as teachers: The benefits of peer tutoring. In R. Pospisil & L.Willcoxson (Eds), *Learning Through Teaching: Proceedings of the 6th Annual Teaching Learning Forum*. (pp. 21–30). Perth, 5–6 February. http://lsn.curtin.edu.au/tlf/tlf1997/beasley.html [viewed 19 Mar 2006]

Berelson, B. (1952). *Content analysis in communication research*. New York: Free Press.

Brown, A.L. & Campione, J.C. (1992). Students as researchers and teachers. In J.W. Keefe & H.J. Walberg (Eds.), *Teaching for thinking*. (pp. 49–57). Reston, VA: National Association of Secondary School Principals.

Carson, N. (2006). Podcast 'revolution' has 9.2M subscribers. *InternetNews*, 14 July. http://www.internetnews.com/bus-news/article.php/3620191 [viewed 22 Jul 2006].

Chan, A. & Lee, M.J.W. (2005). An MP3 a day keeps the worries away: Exploring the use of podcasting to address preconceptions and alleviate pre-class anxiety amongst undergraduate information technology students. In D.H.R. Spennemann & L. Burr (Eds.) *Good Practice in Practice: Proceedings of the Student Experience Conference*. (pp. 58–70). Wagga Wagga, 5–7 September. http://www.csu.edu.au/division/studserv/sec/papers/chan.pdf [viewed 20 Mar 2006].

Clark, D. & Walsh, S. (2004). *iPod-learning*. [White paper]. Brighton, UK: Epic Group.

Collis, B. & Moonen, J. (2001). *Flexible learning in a digital world*. London: Kogan Page.

Curry, A. (2004). *iPodder – A brief history*. http://www.ipodder.org/history [viewed 23 Apr 2005].

Diverse Issues in Higher Education. (2006). Professors getting wise to the power of podcasting. *MacNewsWorld*, 25 March. http://www.macnewsworld.com/rsstory/49519.html [viewed 25 Mar 2006].
Duke University. (2006). *Duke Digital Initiative*. http://www.duke.edu/ddi/ [viewed 2 Mar 2006].
Durbridge, N. (1984). Media in course design, No. 9, audio cassettes. In *The role of technology in distance education*. Kent: Croom Helm.
Georgia College & State University. (2005). *The iPod at GC&SU: A pocketful of learning*. http://ipod.gcsu.edu/ [viewed 2 Mar 2006].
Power, D.J. (1990). The use of audio in distance education. In S. Timmers (Ed.), *Training needs in the use of media for distance education*. (pp. 43–60). Singapore: Asian Mass Communication Research and Information Centre.
Rainie, L., & Madden, M. (2005). *Podcasting catches on*. http://www.pewinternet.org/PPF/r/154/report_display.asp [viewed 7 Jun 2005].
Ramsden, P. (2003). *Learning to teach in higher education*. (2nd ed). London: Routledge.
Read, B. (2005). Drexel U. will give free iPods to students in School of Education. *The Chronicle of Higher Education*, 2 March. http://chronicle.com/free/2005/03/2005030203n.htm [viewed 8 May 2005].
Romero-Gwynn, E., & Marshall, M.K. (1990). Radio: Untapped teaching tool. *Journal of Extension, 28*(1). http://www.joe.org/joe/1990spring/a1.html [viewed 1 Jun 2005].
RSS Advisory Board. (2005). *Really Simple Syndication: RSS 2.0.1 Specification (revision 6)*. from http://www.rssboard.org/rss-2-0-1-rv-6 [viewed 2 Mar 2006].
Schunk, D.H. & Zimmerman, B.J. (1998). *Self-regulated learning: From teaching to self-reflective practice*. New York: Guilford.
Scottish Council for Educational Technology. (1994). Audio. In *Technologies in learning*. (pp. 24–25). Glasgow: SCET.
Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher*, 27(2), 4–13.
Topping, K.J. (1996). The effectiveness of peer tutoring in higher and further education: A typology and review of the literature. *Higher Education*, 32(3), 321–345.
World Bank. (2000). *Technology – Broadcast and computer-based: Radio*. http://www-itsweb4.worldbank.org/disted/Technology/broadcast/broad_radio.html [viewed 31 May 2005].

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A participatory design approach to the development of online tutor training materials: A case study from China

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The role of the tutor in online learning can be complex due to the wide range of media and pedagogies that can potentially be used. As a result there is a need for effective training materials that recognise this and the Sino-UK eEducator project aims to meet this need. This paper reports research into the participatory design approach adopted within the project. Ten potential users of the final eEducator training module are involved in the design process. Reflective journals and interviews have been used to collect data regarding the ways they work with other academics and learning technologists. The paper describes the process, the similarities participants share and problems they confront in this project.

Keywords: participatory design approach, collaboration, eEducator training

Introduction

Learner-centered approaches play an important role in teaching and learning. These approaches are central to China's Curriculum Reform in Basic Education (2001-2010), which aims to meet learners' needs, consider learner differences and support learners in taking a responsibility for their own learning. One would imagine then that in teacher training teacher differences and needs would be considered, learner-centered approaches would be adopted and learner autonomy would be promoted However, it is often quite a different picture. Diaz-Maggioli (2004) points out that globally there are some constraints in current professional development practices. Teacher training often adopts a top-down model with a few experts deciding upon what teachers need to know and how the training should be delivered. As a result the most common form of teacher training is the short or longer-term course in which teachers pass on information or teaching methods they have learnt with the aim that this will change classroom practice (Clark, 1989). This is especially true in both mainland China and Hong Kong. Teachers have little if any ownership of the training process and are likely to be passive recipients of this. Teachers are not allowed a participatory role in making decisions related to the content of their studies or of the ways their training is delivered. There is a case for involving teachers more fully in the design process, after all they will have a very real understanding of what their needs are and of the practicalities of the proposed learning experiences in relation to its impact on their practice. There is also a case for developing an understanding of the participatory design process in order to improve its effectiveness.

This paper reports such research and begins with a review of the processes itself and the context in which the research was conducted – the development of an online tutor training module for use in China. This is followed by a description of the research approach taken to illuminate the participatory design process. The last section discusses the major findings of the research and its implications for future developments.

The participatory design approach

Participatory design (PD) originated in Scandinavia (Schuler & Namioka, 1993) in the 1970s. It started in the field of computer software design, but similar approaches have been used in other fields as well (Silva & Breuleux, 1994). Participatory curriculum development (PCD) in higher education has been promoted by Taylor (2006):

> Today, particularly with an increasing interest in experiential and learner centred education, learners are encouraged to take responsibility for their own learning. At the same time, there has been some recognition that teachers and trainers should have an input into what they teach as well as how they teach it. Still, curriculum development has tended to remain the responsibility of a few, an elite group located at the top of a hierarchy. The idea of other stakeholders having a clearly identified role in curriculum development is rather uncommon.

This idea of involving different stakeholders in curriculum development serves the purpose of enabling the users of a curriculum to take responsibility for their own learning experience, through participating in the design. Axup (2006) points out that PD has a very strong advantage:

> Co-designing with real users in realistic situations and environments helps improve the quality of feedback users provide. Frequent iteration between users and designers reduces misconceptions designers make (in part due to insufficient domain experience).

Understanding users' needs, their preference, their problems and confusions can only be achieved by frequent and profound communication between designers and users. The role of the expert "is changed from that of an expert to that of an equal participant who happens to have expertise" (Carmel, Whitaker & George's research, in Silva & Breuleux, 1994:103). They need to listen to the users' voice and not just take for granted what users may like and have to know. There is a need "for designers to take work practice seriously—to see the current ways that work is done as an evolved solution to a complex work situation that the designer only partially understands" (Greenbaum and Kyng, in Winograd & Kuhn, 2006).

There is a need for users' work experiences to play an important role in the design process and should be highly valued. However, Axup (2006) also points out that there are several pitfalls of PD:

- Participants are usually not trained designers. Consequently they can produce bad designs or feel uncomfortable doing unfamiliar design activities.
- If participants are asked to start from scratch, it will be problematic. They work better with some scaffolding to direct design ideas.
- Users may not be willing to devote time to help build technologies that other people profit from. A key challenge is determining how to interest or motivate participants to help build a product they may not use, and which may be years from production.
- Using a small sample of participants runs the risk of one user being an outlier with unrepresentative concerns. These participants can provide useful challenges to the design, but they should not drive it.

The PD process itself tends not to be the focus of research. What happens during the PD process and what factors influence people involved in that process needs to be researched if the process is to be more fully understood and any benefits for learning design maximised. This paper reports on such research.

Research background

The context for the research is the eChina-UK program, which is a British-Chinese collaborative eLearning initiative, funded in the UK by the Higher Education Funding Council for England (HEFCE) and the Ministry of Education (MoE) in China. The eChina-UK projects under this programme aim to collaboratively develop innovative eLearning teacher training materials for teachers (at secondary and tertiary levels) in selected subject areas. For further information about the programme, projects and partners see http://www.echinaprogramme.org/.

Within the program there was recognition of the importance of the online tutor within eLearning and of the need for effective training. This training needed to engage tutors in understanding their roles in the complex online learning environments in which they would be supporting students. This resulted in the eEducator project, funded by HEFCE. The aim was to develop a generic module that would meet this need. This involved a collaboration between the University of Nottingham (UoN) and Beijing Foreign Studies University (BFSU) A PD approach was adopted within the project and this involved academics, tutors, learning designers and technologists in the collaborative design of the module and the training materials. The hope was that the PD process would ensure that the future users' 'voices', the tutors, would be 'heard' and their working experiences respected.

Research design

Research questions

As a member of the design group, the author of this paper participated in the process of designing online curriculum materials for the tutor training module. During the process, the author experienced dilemmas as did her colleagues. The research set out to explore these and their influence on design. The main research question was: What are the factors that influence eLearning design in the participatory design process?

This can be broken down into the following sub-questions:

1. How do the different professional groups work together in eLearning design?
2. What cultural differences (i.e social culture subject/professional culture etc.), if any, affect online learning design?
3. How do people's beliefs about teaching and learning influence their design of the online teacher training course?
4. What kind of roles do people play in the team work?
5. What is the benefit or influence in involving future users of the course in the design process?

Subjects

There were three groups of participants involved in this research:

Group 1 – Six academics
Group 2 – Three learning technologists
Group 3 – Ten potential users of the course

In selecting these participants, the UoN project team requested the BFSU team to involve people who would be potential etutors for MA ELT online course developed by UoN-BFSU within eChina-UK program. This course intentionally includes a variety of self study, cooperative and collaborative activities and as such represents a challenging learning environment for both students and the tutors. Those selected as project tutors were a representative example of those who would be acting as tutors on the MA ELT. They had at least an MA degree and were from a number of representative regions/cities. Ten volunteer tutors who met these requirements were selected: from 4 regions of China, four from Beijing (Northern China), two from Guang Zhou (Southern China), two from Xi'an (Western China) and two from Shang Hai (Eastern China).

These project tutors were involved in:

- A four week orientation program working as online learners as a means of introducing them to the project and to some online examples from the MA ELT course
- Online collaboration with academics and learning technologists to develop the eEducator materials (from March to December, 2006)
- Face to face collaborative materials development at two four-day residential workshops in Beijing (March and August 2006)
- Supporting research into the participatory process of developing the materials through providing data by taking part in interviews and keeping reflective journals

Research methods and data collection methods

This research uses a critical incident approach (Tripp, 1993). According to Tripp:

> …the vast majority of critical incidents . . . are not all dramatic or obvious: they are mostly straightforward accounts of very commonplace events that occur in routine professional practice which are critical in the rather different sense that they are indicative of underlying trends, motives and structures (pp. 24-25).

Therefore, critical incidents:

> …are not ‘things’ which exist independently of an observer and are waiting discovery . . . but like all data, critical incidents are created. Incidents happen, but critical incidents are produced by the way we look at a situation: a critical incident is an interpretation of the significance of an event (ibid., p. 8).

During the participatory design process, UoN team and BFSU tutors were divided into five groups, each containing academics and tutors. One group contained only Chinese academics and tutors, the others were mixed British and Chinese – where communication was in English. Technical design support was shared amongst groups. The groups began their work at a face-to-face workshop in Beijing, using rapid prototyping tools to demonstrate and discuss their pedagogic ideas. After the workshop, they collaborated in their small groups at a distance to produce further materials for the module. At the end of this first phase (from February to August) another face-to-face workshop was organized in order to share and evaluate the materials developed thus far and to explore ways of working to illuminate the benefits and challenges of PD. Both workshops were audio recorded and monthly reflections from all involved were collected. Team members were requested to identify critical incidents – events that were significant in relation to ways of working, developing understanding etc. Data collection started from February and finished in August 2006, which was the first phase of this project. The outline of this phase and data collection plan is shown in Appendix I (obtainable from the author).

The research began with the collection of background information from the project tutor participants and the UoN project team members. In addition their beliefs about teaching, learning and e-learning were elicited through the use of individual interviews and a questionnaire. The participants in China were from different parts of China, therefore, they were asked to complete a questionnaire before the first face-to-face workshop. Issues that needed further explanation were identified from the questionnaire and participants were interviewed at the first workshop.

Secondly, all small group discussions in the first and second face-to-face workshop in Beijing were audio recorded for research purposes. Every person who was involved in the module design provided a post-workshop reflection about critical incidents during the workshop. The recordings were transcribed and used to triangulate any critical incidents mentioned by group members and identify more critical incidents by the researcher.

Thirdly, every member of the design team (including the UoN team and project tutors) was asked to keep a monthly reflective journal to identify critical incidents that happened each month. The researcher followed up any ambiguous information via face-to–face interview and email to clarify issues. The researcher identified factors that arose that influenced the design process and the materials within each home group from the reflective journals. Each home group was interviewed at the second face-to-face workshop and the end of the project (as part of phase 2 of the research) in order to provide opportunities to verify the data and stimulate more reflections from the participants.

Findings for phase 1

This is the report of the findings from the first research phase, which will inform the second phase of the research. In the following, names have been converted to letters and numbers so that the participants’ identities are protected. Groups are identified as A, B, C, D, and E. The members in each group are numbered as A1, B2 or C3, etc. The technologists are known as T1, T2 and T3. The critical incidents identified in this research and the reflections of the participants are the major data used to analyse factors that influence the PD process.

Participants' major concerns and difficulties in collaboration

The major concerns were time and communication. Most of the participants were very busy with their own daily work and have many responsibilities. They found it hard to allocate enough time to the project.

> One is about time. I have much work to do in my institute and it is difficult to find time to do this project. (D4)

Both the academics and tutors have their full time work on top of this project, not to mention other tasks such as conducting research and writing papers and some of them are executive leaders in their school or department. It is indeed very difficult for them to spend enough time on the project. As for communication within groups, most of them were concerned that email was not adequate for the kind of communication that was needed considering the nature of the project. They were not sure whether effective cooperation could be achieved through online asynchronous communication. One of the groups strongly felt email communication to be problematic as little had been produced through the occasional email exchanges in his group.

> Sometimes, ideas could not be well expressed through language written down. We may need face-to-face communication, or talk to each other. (E4)

This is a small incident but it is critical because none of the project members had realized that language could be a problem for these tutors. Although their language proficiency was relatively high, it seems that language is still an obstacle for communication. It is obviously easier to communicate orally but not so easily in written language.

As it was mentioned previously, the members in group C were all Chinese and communication seemed to work very well in this group. They were the only group to use Skype to conduct voice chat online each week. The following quote seems to indicate that the combination of a shared language and synchronous chat supports collaboration. "We found that online contact is of little difference from face-to-face contact." (C3)

However this may not be just a language issue. There may be cultural and power/authority issues affecting the activity in the other groups. The coordinators in the other groups were all senior UK academics while the coordinator in group C was of similar status and age to the group members.

Ways of working within groups

The academics seem to be put in a position of leading the material design.

> I am very much placed in the position of leading yet I am not taking the leadership role for two reasons: first, that I am still wanting to work collaboratively; secondly, due to time. On the latter, I could email more often and/or suggest other ways of working using the technology without dramatically increasing my time input but there is the sense that I didn't want to push too much. I finish the month with a group member suggesting I push more! (A1)

Most of them did not want to be in that position because they wanted true collaboration. However, the reality was if they did not draft something, ideas were not agreed or moved on. It appears that someone needs to be the secretary and organize ideas into a prototype before others can comment on it. Nevertheless the notion of collaborative activity was problematic within the PD process. Collaboration brings with it the notion of everyone needing to contribute 'equally', but how this is interpreted by each individual in a group is critical. The interviews with all the BFSU (Chinese) tutors after the second workshop revealed that they were happy to give their critical comments on a prototype and that they considered this to be "true collaboration". On the other hand, UoN (British) academics seemed to believe that each should contribute equally to ideas in the first place and only this can be considered as "true collaboration". However the ability of the Chinese tutors to contribute initially was not affected by interpretations of the 'collaboration' but more to do with their unfamiliarity with the themes they were working on. Each group was responsible for one theme related to tutor training and when BFSU tutors were divided into groups they were assigned into the group. They were not given the choice of theme because each theme needed to be developed and the UoN team were worried that some themes might not be chosen if tutors were given the right to choose. In addition the UoN team argued that as the five themes are all related to tutor training, the tutors would be bound to be able to contribute to them and develop an interest during the design process. The reality was that those who were put into a theme with which they were unfamiliar were less confident and worried about their lack of expertise.

> As I was assigned to the Evaluation (Assessment) Group, I was worried about my lack of the knowledge in Testing and evaluation. Therefore, lots of reading needs to be done in the field to understand and then contribute to the development of the project. … In our group of three, obviously A1 plays the role of manager and source of expertise; I am myself contributing my comments and understanding of relevant issues. And this might be the most appropriate at this stage, for A1 does have the most expertise and experience in the field of evaluation. (A3)

Others mentioned in the interview that they had to spend a long time brushing up their knowledge before they could actually contribute significantly to the material design process. One tutor was not at all interested in their theme and she was de-motivated. This indicates that "True collaboration" may need an equal sense of ownership in the decision making process if there should be collaboration in the design process – the choice of academic theme is perhaps more important to a beginning academic than an experienced one.

Another factor that seems to affect the quality and type of contribution is personality. Some of the participants perceive themselves to be passive. For example D3 always waits for instruction/order from his group coordinator. He calls himself a dependent person, waiting for orders. If nobody asks him to do anything, he does not take the initiative. E3 also does nothing because she doesn't feel much pressure from the group members.

> I am a more or less dependent person, waiting for instructions. Almost nothing new has come to me (this month) about the design work. No specific orders. …I didn't receive any orders, no instructions, and I myself was not active enough. (D3)

> To be frank, I tried to allocate at least half an hour the first few days after the workshop looking for and sorting reading materials for ideas. But along with the deadline of other tasks, especially those unexpected, I put the project aside because I didn't feel much pressure from my group members. (E3)

This is unlikely to be a cultural difference issue. What is clear is that peer pressure and tighter action plans might have helped involve the tutors more effectively at an early stage. However each group did try this approach.

The third factor that influenced the behaviour of the tutors might have been how the participants viewed their roles within the project. Interviews with BFSU tutors indicate that most of them were not very clear about their roles. They saw themselves as tutors who had some online teaching experience and who therefore could evaluate critically the materials produced by the UoN team by offering their valuable experiential knowledge. This was a critical point in the project as it was at this moment the UoN team realized that the tutors had not been informed fully about the project.

Similarities and differences

Most participants believed they shared similar beliefs about online teaching and learning in general, but when it came down to specific ways of presenting the materials disputes arose.

> We share some similarities about some basic principles about effective online learning and tutor training, but we may have very different ideas for some specific ways or processes, because we come from either different cultural background or online work experiences. Everyone would have his or her own understandings. In our group, when we came to the metaphors to be used, I personally would prefer to choose some more typical Chinese

> symbols, but I found the British academics would like to have their western symbolizations, like the pumpkin, the birds, and etc. (D3)

The choice of symbols and images reflects the designers' perspective of teaching and learning as well as their understanding of the target culture. The difference in this incident shows that careful study of metaphors in different cultures when working inter-culturally is necessary. Some of the BFSU tutors thought that the UoN team needed to be more familiar with the Chinese context, especially the way Chinese learners learn.

> It turned out that the awareness of China's unique education atmosphere was somewhat inadequate, e.g. What would be the most benefited target group of this project? What strategies would be best applied to the selling and marketing of the course? Cultural differences had been another gap in the cooperation process. I tried my best to work as a "bridge" during our home group discussions. … the main gap was the different ways in thinking, the Chinese way and the British way. (B2)

This tutor believes that Chinese and British have different way in thinking. This is proved by one incident in her group. At one time, they try to organize ideas into different levels. The UoN member wants to discuss about the details of how they might present the start so that they can gain the attention of the learners right from the beginning, while another member (the Chinese member) prefers to consider the overview first before going into details. The third member reflects that:

> It seemed to me that both B1 and B3 were trying to persuade the other with his own ideas, both were strong people, I felt if I wouldn't do some coordination work, the two would certainly break up and quarrel. Either of them was correct, they were just looking at the same thing from different perspectives. B1 would like to look at specific things first, while B3 would approach things from the general point of view. Finally B1 gave up and we all followed B3's way of thinking. (B2)

In a later interview, B3 said he found it difficult to understand the British way of thinking at the beginning but later he was getting used to it slowly. The work within this group was getting smoother. Successful collaboration very much depended on the willingness of the group members listening to each other and being ready to compromise.

However, some participants felt that the difference was not necessarily a cultural one; rather it is the difference of personality or personal preference of ways of thinking.

> I was left feeling that the bigger differences were not so much due to the cultural perspectives of the UK and China being at odds, rather that the emphasis of the way I was thinking in terms of developing the materials was different to much of the current practice… (A1)

> Differences in the team seemed to come from personality - not culture or academic beliefs. (D1)

It is true that every single person is different. Some have much stronger personalities than others. The way of tackling things is also different from person to person. It is therefore important to develop a certain degree of trust and sense of belonging within the group. This helps to smooth the relationship among group members and enable them to work better

Role of technologists

As already mentioned, one of the strategies used in the project was to produce rapid prototypes so that ideas could be visualised and shared. One critical moment for the whole team was when they were presented with rapid prototypes of their ideas at the first workshop.

> The 2 presentations were important– there was a real sense that we were achieving something as a small group and collectively. This helped motivate the group and it set tight deadlines for developments. (B1)

> When we all saw the mock up, this showed us all what the potential might be. I think that this is where the technical involvement in the process can be critical in moving things on. (A1)

> They listened to our ideas and T3 helped to develop the rapid prototype. He was very quick and the rapid prototype helped us to see our ideas visually and it was what we wanted. (C1)

This illustrates the importance of involving technologists as much and as early as possible. Academics and tutors are not necessarily experts in technology. They need technologists to show them the possibilities of what technology can offer and to help them try out ideas. What's more, technologists need to be open to new ideas, to listen, and to offer their suggestions. In this way, pedagogy can lead the development of technology and technology can enhance pedagogy.

In the first workshop, technologists were invited into each group after their initial group discussion to listen to their ideas so that they could help to develop these into a rapid prototype. Most of the participants mentioned that the technologists were very patient and supportive and that the level of creativity was astonishing.

> They would have been more helpful if they had been invited to join the activities of the home groups…. because their suggestion might save much time spent discussing the layout of the web page. For example, once B1 thought hard on how to arrange the web page, but a few words from T1 (one of the technologists) made every thing clear. (B3)

> The very act of having them in the workshop sessions is till now most effective in this cooperative project of ours. With their help, I have come to realize that technology can actually do much more than I can imagine. (A3)

Influence on participants

It is still too early to see any strong influence on participants. However, some of the tutors have mentioned in their reflections that participating in the design process has already started to influence their work and thoughts. A critical incident reported by B2 describes how she was inspired by her group member B3's idea. B3 developed an efficient way to help his learners to handle their workload and study appropriately. This stimulated B2 and she tried out similar things with her learners and unexpectedly obtained a high number of positive responses from them. Another participant D3 happened to be in a theme which was rather new for him. He found the theme valuable and wanted to integrate it into his own tutoring. He developed a much clearer understanding of the theme through wider study and than wrote an academic paper for a journal.

These examples show that participating in the course design process not only helped the online tutors to improve their teaching but also supported them in becoming "teacher researchers". They not only contributed to the design process but also were stimulated by it.

Conclusion

The results from phase 1 of the research have already shown an interesting and dynamic picture of collaborative group work using participatory design approach. Some participants have expressed concerns about the final product, the need to make compromises and avoid conflict may "result in a lesser quality and product" (D1). However, in China and in the UK there is a saying: three heads are better than one. The compromise people make is not necessarily a sacrifice; on the contrary, it could turn out to be a better choice/decision. In phase 2 of the research, comparisons between groups and activities (face to face and online) using activity theory (Engeström, 1987) will be drawn to illuminate influences on ways of working in groups and the influences on the pedagogic outcomes.

References

Axup. (2006). *Effective use of participatory design methods* http://www.mobilecommunitydesign.com/archives/000164.php [viewed 20 July 2006].

Clark, J.L. A. (1989). Cross-cultural comparison of teacher perceptions in Britain and Hong Kong as to how best they can be supported in their work. In V. Bickley (Ed.) *Language Teaching and Learning Styles Within and across Cultures*. Hong Kong: Institute of Language in Education, Hong Kong Education Department.

Diaz-Maggioli, G. (2004). *Teacher-Centered Professional Development.* Alexandria: Association for Supervision & Curriculum Development

Engeström, Y. (1987). Learning by expanding: An activity-theoretical approach to developmental research. Helsinki, Orienta-Konsultit. http://communication.ucsd.edu/MCA/Paper/Engestrom/expanding/toc.htm [viewed 20 July 2006].

Schuler, D., & Namioka, A. (1993). *Participatory design: Principles and practices*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Silva, M. & Breuleux, A. (1994). The Use of Participatory Design in the Implementation of Internet-based Collaborative Learning Activities in K-12 Classrooms. *Interpersonal Computing and Technology* V.2, N.3, pp. 99–128.

Taylor, P. (2006). *Participatory curriculum development: is real participation possible?* http://www.undp.org.vn/projects/vie96010/cemma/RAS93103/012.htm [viewed 20 July 2006].

Tripp, D. (1993). *Critical incidents in teaching. Developing professional judgment*. London: Routledge.

Winograd, T. & Kuhn, S. (2006). *Participatory Design*. http://hci.stanford.edu/bds/14-p-partic.html [viewed 10 July 2006].

Objectives for Curriculum Reform in Basic Education in China, 2001－2010. http://www.edu.cn/20011126/3011703.shtml [viewed 25 July 2006].

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Bionotes

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Driving online education: The Swedish Net University – a case study in purpose and pedagogy

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This paper maps the development of the Swedish Net University and raises theoretical and practical questions about its purpose and its effect on pedagogically sound e-learning. The paper analyses what happens when e-learning is driven from the top and universities are rewarded with money for putting their courses online. It also studies the effects of online availability of university courses for marginalised groups in society. It is clear from research undertaken for this paper that mature age, remote area, immigrant and female students have more opportunity to study because of the establishment of the Net University in Sweden. The extent to which social engineering was a factor in the government's decision to create the Net University is discussed in relation to this broadening of recruitment. The fact that the Net University is a virtual organisation which acts as a broker for courses is also studied. Some courses are specially designed to be offered online while others are traditional courses that are simply downloaded to the net. Contrasting the two enables the author to argue for a pedagogy of e-learning.

Keywords: educational paradigms, computer mediated communication, ICT policies and strategies

Background

The Swedish Net University was created in March 2002 in order to encourage Swedish universities to put their courses online. The Swedish government has invested heavily in Information Communication Technology (hereafter ICT) and according to Economist Intelligence Unit is one of the world's leading countries in terms of e-learning readiness. Despite this Swedish universities have been slow to go online. The government provided SEK 600 million (about AUS $100 million) in an effort to change this. Some of the money was spent in setting up the agency itself but SEK 500 million was given directly to the universities who agreed to put their courses online. In Sweden the government reimburses universities retrospectively for every successful graduate from the previous years. The exact amount differs depending on the subject. An a successful pass in arts might attract SEK 30, 000 while a similar pass in say the first year of a physics degree could attract up to SEK 80, 000. The government, irrespective of the subject gave universities SEK 90, 000 for each successful pass in a course that had been put online. This naturally encouraged universities to put many humanities courses online while a university such as Chalmers, which already received a high reimbursement was less interested.

Since 2002 over 35 universities and university colleges in Sweden have offered their courses online. The largest number of distance courses last year were offered by Mid Sweden University, (276), University of Gävle (191), Uppsala University (168), Lund University (140), Gotland University (139), and Umeå University (133). The range and number of courses offered by these and other universities is, however expanding rapidly. It is important to note that the Net University is really a broker of online courses rather than a university in its own right. It has created a database of the courses that can be accessed via its website and it helps students, via easy links, to enrol online in the course of their choice. The Net University's primary aim is to enable a greater number and wider range of students to obtain a university degree, using distance education. Information technology (IT) makes it easier for people from remote areas to study from home via the Internet as well as giving those who must work part or full time an opportunity to study in a more flexible manner than via on campus, nine to five lectures and tutorial. A course offered via the Swedish Net University is equivalent to the corresponding campus course. The institution offering the course is responsible for the quality of the course, with additional quality assessment provided by The Swedish National Agency for Higher Education. (The source for the above information comes from the Net University's homepage: http://www.netuniversity.se/)

The study

There are currently about 2, 700 courses offered via the Net University. In this study the author carried out a content analysis of a random sample of online courses offered via the Net University. This study was designed as a pilot for a larger project that aims to determine the pedagogical quality of courses offered online via the Net University. Twenty courses were analysed, half from the humanities and half from the sciences. Two criteria were used in the analysis. The first was the extent to which the course descriptions indicated awareness of pedagogical thinking in terms of an alignment between well written learning outcomes and assessment. The second was the extent to which to which the potential of ICT was used. In other words if the course was simply an uploaded version of a largely text based course it did not meet the second criteria. In addition to this content analysis the author asked twenty teachers from his own university about their views of putting their own courses online. The reason for this survey was that Chalmers has, as yet, not offered any of its courses to the Net University. It was suggested above that economics might be a large factor in this. Are there other factors? Is this an institutional decision? Would individual teachers be interested to make their courses available online given the right conditions?

Before providing the results of the study it is important to flesh out a little the notion of alignment between learning outcomes and assessment (Biggs, 1999). Since it was hard to determine alignment between outcomes and assessment in many of the descriptions that were analysed more attention was paid to the way in which learning objectives and outcomes were couched. While it is acceptable to generalise somewhat in writing one’s objective it is very important in writing learning outcomes to let the students know exactly what they must do in order to demonstrate the knowledge and skill that warrants a pass in the particular subject. This seems simple common sense but it is only in the last couple of decades that university teachers have begun to focus on what the student does rather than on what the lecturer does (Mortimer, 1999; Cranton, 1992). As this study indicates there are still obvious shortcomings in this regard. In the descriptions analysed for this paper we defined ‘well written learning outcomes’ as those that revealed an understanding of Bloom’s or Bigg’s taxonomies, where verbs indicate the type as well as quality of learning that is expected.

Results of the study

Of the 20 courses that were sampled 80% of the course descriptions revealed a teacher centred approach. In most cases the descriptions spoke about how students would be helped to understand aspects of a subject. Even in some subjects that included elements of pedagogy the outcomes were expressed in terms of ‘developing the student’s understanding’. There was no attempt to define what was meant by understanding. And certainly there were very few examples of what students had to do to prove that they had understood something.

Although it is more difficult to argue alignment or lack of alignment from short course descriptions there were almost no examples of a clear alignment. One might have expected some cases in which the learning outcomes were mirrored in the assessment descriptions. This was not the case. General categories of assessment were given rather than indications of how, for example, the ability to demonstrate, explain, define, analyse, calculate or report on aspects of a subject would be tested.

In terms of the second criteria over three quarters of the study materials looked at were heavily text based. This was particularly so of some of the larger, more prestigious universities that offered their courses online. Some university courses (one for example in the area of management) made use of ICT to enable more pedagogical material. In other words by the use of links and some multimedia effects the subject matter was made more interesting and accessible. This is a value judgement on the author’s part and would need to be tested in a more thorough investigation where students themselves were interviewed and their results analysed.

From the survey of Chalmers teachers it was clear that most of them did not see any advantage in putting their own courses online. These teachers had undertaken a course in pedagogy using a learning management system (a Norwegian product called Fronter) and although they appreciated the chance to submit assignments online and the opportunity to chat, join a discussion group or work on projects where they shared documents, very few of them made real use of these tools. Only when they were given a specific task did they make use of the ICT potential of the learning platform. In their response to the survey they indicated that the reason they made so little use of Fronter during their course is the same reason that they would not put their own courses online. They simply do not have the time and what time they do have they prioritise for activities that are rewarded by their institutions and by Chalmers itself, namely, research.

Chalmers is a university that sees itself as a Scandinavian MIT. Just as the Massachusetts Institute of Technology values its on-campus activities, especially its research activities, above any online presence so Chalmers works hard to provide on campus accommodation for its students and build a strong cooperative research ethos within its institutions. The fact that it has not participated at all in the Net University's initiative is a confirmation of this. Although Chalmers has paid lip service to the concept of the 'Learning University' (Bowden and Marton, 1999) it is not at this stage ready to embrace new technology and new paradigms of teaching and learning. There are some teachers who indicated that they already provide online access to their courses by downloading material and maintaining homepages with extra links and information. There were two teachers who had gone even further and created some online exercises that used virtual equipment where students could test their knowledge and understanding (in this case of electromagnetic fields). They were the exception to the rule.

Discussion

The Net University has achieved its principal aim which is to make university education more accessible to a more diverse group of students. Mature age, remote area, immigrant and female students have been over represented among the users of the Net University's services. In setting up the Net University the social democratic government indicated that this was one of the purposes of establishing such an agency. The importance of increasing inclusivity has been noted earlier by Christie (1998); Göransson (1995) and Young (1998). After four years of operation the Net University is now part of a larger government agency called the Agency for Networking and Cooperation in Higher Education (the Swedish abbreviation is NSHU). After the initial monetary incentives are phased out it is expected that universities will continue to put courses online in order to win students in an increasingly competitive climate. As Sweden's economy continues to grow more and more school leavers are choosing to take on jobs rather than study there is a discernible decrease in the numbers applying for university places. This is the case today where there has been a drop of between 10% and 18% in enrolments to universities at the start of the 2006 academic year.

Not all of the older, more prestigious universities have placed their courses online with the Net University. Of those that have some appear to have simply uploaded courses rather than make an effort to truly adapt the material to an online format. The fact that neither Chalmers, nor its counterpart, the Royal Technical University (KTH) in Stockholm, have taken up the opportunity is significant. Both have little trouble filling their quota of students and although there has been no clear reasons given for the lack of interest their focus on research is a feasible one.

Table 1: Universities offering courses via the Net University

Online courses					
University	**Number in percent**	**Number of students**	**University**	**Number in percent**	**Number of students**
University in the West	18%	959	*Halmstad*	10%	597
Umeå	13%	2 476	*Borås*	9%	533
Skövde	11%	556	*Göteborg*	6%	1 683
Uppsala	11%	2 651	*Linköping*	5%	883
Lund	11%	3 206	*Stockholm*	3%	810
KTH	0%	0	*Chalmers*	0%	0

In the case of Chalmers undergraduate education, it could be argued that it has, until recently, put its faith in a pedagogical model that is characterised by activities such as lectures, tutorials and laboratory work. It is assumed that these activities will take place on campus. An important part of this pedagogy is to test and grade the quality of student learning by means of practical exercises and end-of-course, closed-book exams. The architecture of the university mirrors this not so 'hidden curriculum'. The medium of lecture hall, tutorial room and laboratory is the message, and in two out of three of these locations, the lecturer and the tutor occupy centre stage and communication is usually one way (McLuhan, 2001). The quality of learning that occurs depends not only on the model described above but also on the quality of individual teachers and students. Lecturers, who encourage a surface approach to learning by setting poorly constructed exams, can breed 'imitation' scholars who neither love nor understand their subject (Sawyer, 1943). Until the second half of the twentieth century traditional university pedagogy worked quite well. The reason was that it served a small group of elite students. As wealthier societies needed and could afford a more skilled workforce the percentage of school leavers who went to university increased from one or two percent in the 1960s to more like twenty percent by the end of the century. Today countries like Sweden hope to send half of their student population to tertiary institutions.

Changes in university demography mean that more and more students need assistance if they are to pass the sort of exams that were set for earlier generations. Both on and off campus there are fewer wealthy dilettantes and far more vocationally oriented students. An on-campus pedagogy designed for an intelligent elite does not suit a mass influx of students, more and more of whom will study online. An important remedy is to start thinking in terms of the student rather than the teacher and to construct courses that are constructively aligned so that students can see clearly what they must do in order to acquire the knowledge and skills required to demonstrate mastery of a subject (Biggs, 1999; Ramsden, 1992). Online courses, offered via agencies such as the Net University, are part of a government strategy to broaden participation in tertiary education. If the quality of that education is to be maintained then it is essential that online courses are pedagogically sound and make full use of the educational potential of ICT (Christie and Ferdos, 2004; Koschmann, 1996; Laurillard, 1999). ICT offers enormous opportunity for presenting study material that is not only constructively aligned but also varied in its content and levels of difficulty so that it appeals to different learning styles and different intelligences. As in all organised educational enterprises the people concerned must work together, giving each other encouragement, support and feedback. Teachers bear the greatest responsibility here. It is their job to facilitate learning and they can do that best by ensuring their course material motivates students to learn and activates them during the learning process. Since the smooth use of ICT as an educational tool requires support from administrators, educational technologists and technicians good online teachers will also have to manage and cooperate with a new network of people. In an age where there will be more and more Net Universities (Kargidis et al., 2003) changing one's teaching and learning paradigm is both challenging and a rewarding.

References

Biggs, J. (1999). *Teaching for quality learning at university*. Buckingham: SHRE&OP.

Bowden, J. and Marton, F. (1999). *The university of learning*. London: Kogan Page.

Christie, M. (1998). Whose web: cultural factors in the delivery of online courses – an Asia Pacific case study. In J.M.R. Cameron (Ed). *Online teaching*. Darwin: CTLDEC.

Christie, M. and Ferdos, F. (2004). The Mutual Impact of Educational and Information Technologies: Building a Pedagogy of E-learning'. *The Journal of Information Technology Impact (JITI)*, 4(1), 15-26.

Cranton, P. (1992). *Working with Adult Learners*. Toronto: Wall & Emerson.

Göransson, A. (1995). *Kvinnor&Män i civilingenjörsutbildning.* Göteborg: Chalmers.

Kargidis, T., Stamatis, D. and Manitsaris, A. (2003). Virtual Learning Institution: A Distributed Model for Networked Open Learning for the Purposes of Lifelong Learning. *Journal of Information Technology Impact*, 3 (1), 11-24.

Jackson, S.A. (2004). Ahead of the curve. Future shifts in higher education. *Educause Review*, 39 (1), 10-18.

Koschmann, T. (1996). Paradigm shifts and instructional technology: an introduction. In T Koschmann (Ed), *CSCL: Theory and practice of an emerging paradigm* (pp. 1-23). Mahwah, New Jersey: Lawrence Erlbaum.

Laurillard, D. (1999 edition). *Rethinking university teaching: a framework for the effective use of educational technology*. London: Routledge.

McLuhan, M. (2001 edition). *The Medium is the Massage*. New York: Gingko Press.

Mortimer, P. (1999). *Understanding pedagogy and its impact on learning*. London: Chapman Publishing.

Ramsden, P. (1992). *Learning to teach in Higher Education*. London: Routledge.

Sawyer, W. (1943). *Mathematician's Delight*. Hammondsworth:Penguin.

Young, R .(1998). A developmental model for selecting computer mediated communication approaches for tertiary education course delivery. In J.M.R. Cameron (Ed.) *Online teaching*. Darwin: CTLDEC.

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Real use research evaluation of an online essay writing module: Information literacy eLearning modules project

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This paper reports on a work in progress. Evaluative research findings for one module from the New Zealand Tertiary Education Commission (TEC) funded project, *Information Literacy e-Learning Modules* are presented. *Essay Writing with Readings* is the first authentic task-based online information literacy module to be piloted and trialed with students and staff. Evaluation of the usability and effectiveness of the module was conducted in 2006 in real use contexts as part of a class, and as a stand-alone resource. The aim of the project was to develop a range of on-line modules (11) over two years, predicated on the Australian and New Zealand Institute for Information Literacy (ANZIIL) standards of information literacy (Bundy, 2004), which are derived from standards developed by the American Library Association (2006). The modules are amenable to adaptation and use in a range of contexts, as well as accessible to diverse groups of learners. Broad findings from the evaluation of *Essay Writings with Readings* showed the module, in essence, as meeting the project aim. Participants strongly endorsed the module, which had relevance for users with a diverse range of backgrounds and experiences. The researchers also concluded that the module has potential for adaptation, development and customisation as a teaching tool. The research methodology which generated these findings was both quantitative and qualitative. The evaluation involved 23 participants, both staff and students, from university, polytechnic and college of education backgrounds. Refinements for the evaluation of additional modules are noted as the project proceeds into its second year.

Keywords: information literacy, online, essay writing, research evaluation

Introduction

Information Literacy e-Learning Modules project is funded through the TEC's e-Learning Collaborative Development Fund (eCDF). Launched as a collaborative venture between the University of Otago, Dunedin College of Education and Otago Polytechnic, it started out as a one year project and has recently been awarded funding for a further year. The aim of the project is to develop a range of online modules, predicated on the ANZIIL standards of information literacy (Bundy, 2004), and amenable to adaptation and use in a range of contexts. The project was conceived to address four main areas in the tertiary sector associated with information literacy learning:

- Barriers to tertiary study which can occur as a result of poor information literacy skills and the diverse needs of marginalised, mature and distance students;
- A shortage of high quality online information literacy modules which are reusable, portable and have pedagogical flexibility;
- A need for professional development opportunities for staff in the area of information literacy;
- A tertiary sector requirement for centrally maintained and managed, standards- conformant, online resources in this important foundation field.

The key goals for the two years of the project are to:

- Design, implement and evaluate eleven authentic task-based information literacy modules underpinned by the ANZIIL standards (Bundy, 2004);
- Design, implement and evaluate an online demonstrator system for selecting existing modules, as well as editing and publishing new modules;
- Develop modules which are reusable in a range of contexts and able to work offline, online or through a Learning Management System (LMS) or via a Shareable Content Object Reference Model (SCORM – definition at end of paper) 1.2 compliant player (Advanced Distributed Learning, 2004).

During the first year of the project, five authentic task-based information literacy modules were developed: Essay writing, Annotated Bibliography, Business Report Writing, Scientific Report Writing and NZ Information Sources. The six modules planned for development during the second year of the project are: Introduction to Information Literacy, Searching, Evaluating, Ethics, Digital Information Literacy and, Maori and Pacific Sources.

The first five modules have undergone usability testing and expert review during the prototype development, and the essay writing module has been piloted as part of a research evaluation project. Expert review regarding interoperability, SCORM compliance and adherence to ANZIIL standards has also been completed for the Essay Writing module.

Overview of the research evaluation project

The module *Essay Writing with Readings* is the first authentic task-based information literacy module to be piloted and trialed with students and staff in real use contexts as part of a class, and as a stand-alone resource. The content of the module is based around a real essay writing assignment used in a course and uses The Treaty of Waitangi as the topic. Evaluative research on the usability and effectiveness of the module was conducted between February and June 2006. The research participants were drawn from the three institutions involved in the project. A report, outlining the research process, has been prepared for the Tertiary Education Commission by the project's Analysis and Evaluation Group (2006). It sets out the sequence of methodology and data analysis used in the research, and presents the derivative findings and recommendations.

The evaluation of *Essay Writing with Readings*, informed the development of four subsequent modules, sharing the same layout, navigation, graphic style, and modeling on authentic activities – see Figure 1. On this basis we feel it is reasonable to assume the approach used in the development of *Essay Writing with Readings* is likely to work in other contexts. Initial feedback from early trials of the additional modules supports this assumption. Evaluation of all modules will continue in the second year of this project.

Figure 1: Screen shot of module layout

A key target for the second year of the eCDF 423 Information Literacy e-Learning Modules project, as a whole, is the provision of an online system which will allow modules to be edited. We anticipate that in this way specific issues around context, treatment of subject material and so on can be addressed by teachers themselves who wish to repurpose the modules for their own students. A research study will be undertaken in the second year of the project to see if this occurs.

This article about the evaluation research project provides a synopsis, and covers the methodology, results and discussion about the findings and conclusions.

Methods and results

The research methodology which generated these findings was both quantitative and qualitative. It involved 23 research participants, both staff and students, from University, Polytechnic and College of Education backgrounds. A dual methodology allowed both descriptive and interpretive information to be gathered using a combination of observation, Likert scale questionnaires and interviews which afforded opportunities for triangulation. Data gathered from the participants enabled the researchers to build a profile of the users in the study (age, gender, ethnicity, language, computer experience, institution and status, study area), and ascertain their eLearning needs and previous experience with essay writing. Researchers also investigated user expectations of the module, their overall impressions, and asked for their critique of features they liked and did not like and suggestions for improvement. Specific features of the module relating to content, effectiveness for learning, instructional design and navigation were also investigated.

Findings from the evaluation of *Essay Writings with Readings* showed the module, in essence, as meeting the project goals, and strongly endorsed the module, which was welcomed by staff and student users in University, Polytechnic and College of Education settings. The findings show the module as:

1 Having relevance for users with a diverse range of backgrounds and experiences. This diversity encompassed age, gender, specialist field of study and prior exposure to information technology;
2 Rich in potential for adaptation, development and customization;
3 Being especially welcomed, by tertiary staff, for its potential as a teaching tool.

The researchers found that participants' perceptions of their own e-learning needs reflected diversity of prior experience and future career aims among the participant sample. Over half of all responders rated their skills in retrieving, analysing and applying information as elementary or traditional or, in two cases, both elementary and traditional. A majority of the group with self-rated, elementary or traditional skills also felt challenged by the demands of today's e-Learning environment.

Overall, participants rated the module favourably, (average rating 3.5 on a scale from 0 to 4.5) – see Table 1. Additionally, the content of the module Essay Writing with Readings was analysed across several dimensions (participant profile, general comments and recommendations offered by participants, self-perceptions of e-learning needs for the preparation and writing of essays, overall rating of the module, perceptions of the specifics of the module's content, instructional design, navigation and effectiveness of the module as a learning tool).

Research participants responded to the items listed in Table 1 on a four-point Likert scale, with a "4" response indicating strong approval or agreement and a "1" response indicating strong dissent. In the tabulated data pairs, the first figure gives the mean score for the tabulated item, and the second figure gives the mode. Means of 3 or more and modes of 3 or 4 suggest broad approval or agreement, among responding participants, for the item concerned. Means of less than 3 suggest a degree of negativity, at least among some responders, regarding the item. The listing sequence in Table 1 ranks the items in order of overall mean affirmation or approval among responding participants.

As well as information gleaned from the rating of the module content, participants also offered suggestions for further improvement. For example, a fifth or more of responders, in questionnaire comment or during interviews, suggested that referencing also include formats other than APA. Along with high ratings of the content, most aspects of instructional design present in the *Essay Writing with Readings* module were also perceived favourably. For example," important concepts are highlighted, visual layout is appealing and design elements rated highly". However, 27% of responders made no evaluation of sound and narration in the module. Because of technical difficulties, these participants had not been able to access the module's audio material at the time of evaluation. Responders who did offer evaluation of the module's audio elements differed widely in their perceptions and evaluations of the audio facility. The visual elements of the module, on the other hand, were appreciated warmly by most responders.

As well as measuring participants' perceptions overall about the module, their opinions about the content and instructional design, and aspects of navigation and effectiveness for learning were also obtained. Response data showed that, overall, users felt able to move freely through the module, and overall, that the module was effective as a tool for learning. They found primarily, that the design enhanced understanding of concepts, and that learning activities were interesting.

Table 1: Participants' overall ratings of the module essay writing with readings - Response means/modes, based on a four-point likert scale (n = 22)

Items	All responses	College student	Polyt student	Univ student	Staff	Female	Male	Students aged 31+
Overall usefulness and effectiveness of module	3.55/ 4	3.33/3	3.80/4	3.43/3	3.75/4	3.56/4	3.50/4-3	3.50/4
Effectiveness as an aid to processing information, preparatory to writing an essay	3.50/4-3	3.50/4-3	3.60/4	3.29/3	3.75/4	3.56/4	3.25/3	3.50/4-3
Ease of use	3.50/4-3	3.33/3	3.40/3	3.86/4	3.25/3	3.44/3	3.75/4	3.33/3
Relevance to user need	3.45/4	3.83/4	4.00/4	3.14/3	2.75/3	3.44/4	3.50/4-3	3.83/4
Effectiveness as an aid to applying information, preparatory to writing an essay	3.45/3	3.17/3	3.60/4	3.29/3	3.75/4	3.39/3	3.75/4	3.33/3
Enjoyable	3.23/3	3.50/4	3.20/3	3.00/3	3.25/3	3.28/3	3.00/3	3.33/4
Effectiveness as an e-learning aid specific to preparing an essay on the Treaty of Waitangi	3.23/3	3.50/4-3	3.60/4	2.71/3	3.00/3	3.39/3	2.25/3	3.67/4
Effectiveness as an aid to locating and retrieving information, preparatory to writing an essay	3.18/3	3.00/3	3.00/3	3.14/3	3.50/4-3	3.11/3	3.50/4-3	3.17/3

While feedback was mostly positive, there was a lot of constructive suggestions made as well. The findings of the research also indicated there are some aspects of the module requiring attention. For example, module length and volume of material covered could be addressed by streamlining the content, and re-sequencing of material to create a more effective conceptual flow through the module. Additionally, participant responses suggested that supplementing the module's structured approach with a choice of more open-ended learning experiences would be beneficial. These might relate both to the module's information literacy-related content and to its contextual exemplar, in this case *The Treaty of Waitangi*. The points can easily be addressed by use of the online editor for customisation, which will be available later in 2006.

Conclusions

Overall, the module was well received by the 21 participants, students and staff from university, polytechnic and college of education settings, who took part in the research evaluation project. The results indicate that the module has relevance for users with a diverse range of backgrounds and experiences. Users varied in age and gender as well as in their field of study and prior exposure to information technology. Participants saw the potential of the module for modification and development in real use contexts. The module was especially welcomed, by tertiary staff, for its potential as a teaching tool.

The methodology proved effective in generating relevant data which was amenable to analysis and triangulation. Project goals such as reusability in relation to SCORM and adherence to ANZIIL standards were not addressed as part of this research, and have been reported elsewhere. Refinements of the research design which will be borne in mind for the evaluation of future modules include: Trialing modules with both broadly selected participants and specific user groups, for example students studying specific types of course, to see whether patterns suggested among the randomly selected sample are verified in specific contexts.

However, it should be noted, that any participant concerns about the module sprang, not from a substratum of disapproval, but from a strongly positive sense of the module's potential. Precisely because research participants enjoyed and valued the module, they were, without exception, fluent and free with constructive and critical comments. They saw the module as something to be welcomed, as a venture worthy of development with a view to wide implementation. Most participants inquired, with positive interest, about the module's future path, and expressed an explicit wish to be kept informed. The flow of participant suggestions testifies to the module's fundamental health. The findings from the research evaluation of the *Essay Writing with Readings* module will inform modification of the first five modules developed as well as development of the six additional modules in the second year of the project.

References

Advanced Distributed Learning (ADL), (2004). *SCORM 2004 overvie*w, *2nd edition.* http://adlnet.org/scorm/history/2004/documents.cfm [viewed 20 Jun 2006].
American Library Association (ALA), (2006). *Information literacy competency standards for higher education*. http://www.ala.org/acrl/ilcomstan.html [viewed 9 Jul2006].
Analysis and Evaluation Group (AEG). (2006). *Evaluation report - Essay writing usability of prototype results for information literacy eLearning modules: Reusable and portable across a College of Education, a Polytechnic and a University project.* http://oil.otago.ac.nz
Bundy, A. (Ed.), (2004). *Australian and New Zealand information literacy framework. Principles, standards and practice*, (2nd Ed.). Adelaide: Australian and New Zealand Institute for Information Literacy (ANZIIL).

Definitions

SCORM is a collection of standards and specifications adapted from multiple sources to provide a comprehensive suite of e-learning capabilities that enable interoperability, accessibility and reusability of Web-based learning content.

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Learning with wireless mobile devices and social software

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The paper outlines the beginning of research into the synthesis of mobile personal technologies, social technologies, and constructivist pedagogies, and briefly explores the potential for creating student-centred collaborative learning communities using wireless mobile devices (e.g. PDAs, Ultra Mobile PCs, mobile phones and smart-phones) and social software (e.g. blogs, RSS, instant messaging, moodle, elgg etc…). Instead of simply re-purposing content to fit small screen wireless devices, a wide range of social software tools can be used to facilitate social constructivist pedagogies informed by constructivism, social constructivism, communities of practice, and a conversational model of learning. Many social software services provide mobile versions of their services, and there are a growing number of dedicated services for mobile devices, as well as Java, Symbian, Palm OS, and Windows mobile client applications. Several example scenarios are outlined.

Keywords: social software, wireless, mobile, cell phones, PDAs

Introduction

This research project will investigate the potential for establishing the use of wireless mobile devices (WMDs) as core ICTs (Information and Communication Technologies) within tertiary education courses. The potential of mobile devices integrated with a campus wireless network can facilitate the use of e-learning tools to enhance tutor–student and student–student communication, collaboration, reflection and critique. Student productivity will be enhanced by the provision of a ubiquitous computing environment.

The research project will involve a series of reflective trials (action research cycles) using WMDs to harness the potential of current and emerging social constructivist e-learning tools (e.g. Moodle, blogs, wikis, podcasting etc…). The research project is based upon explicit social constructivist pedagogy (Bijker, Hughes & Pinch, 1987; Lave & Wenger, 1991; Vygotsky, 1978; Wenger, McDermott & Snyder, 2002), and aims to develop a strategic implementation plan for incorporating WMDs into tertiary education and sound pedagogical guidelines. The underlying social constructivist tools are not bound to any single WMD technology, or specific learning context, and therefore the outcomes/strategies/pedagogies identified by the research will be generalizable and transferable. It is postulated herein that WMDs are disruptive technologies that are useful in challenging established pedagogies, providing a catalyst to move tertiary education towards social constructivism.

While there are several examples of integration of Palm, PocketPC, smart phone and laptop devices in tertiary education in overseas institutions, few are based on theoretical models of learning. It has also been noted that the majority of mobile learning trials have not used rigorous evaluation techniques, have failed to measure student learning, and have not attempted to provide a well-defined pedagogical basis for the research or learning activities used (Kukulsa-Hulme & Traxler, 2005; Traxler & Kukulsa-Hulme, 2005). This project attempts to address these concerns.

Research questions

1. What are the key factors in integrating WMDs within tertiary education courses?
2. What challenges/advantages to established pedagogies do these disruptive technologies present?
3. To what extent can these WMDs be utilized to support learner interactivity, collaboration, communication, reflection and interest, and thus provide pedagogically rich learning environments that engage and motivate the learner? To what extent can WMDs be used to harness the potential of current and emerging social constructivist e-learning tools?

Background

Social software

'Social software' – interactive collaborative software – is one of the key features of what has been termed 'Web2' (O'Reilly, 2005). A good overview of the potential of social software in education is the chapter: ‘Social Networks’ by Leon Cych (2006). Web2 is about: moving beyond content delivery to personal publishing, ease of use, interactivity, collaboration, sharing, and customisation.

Wireless Mobile Devices (WMDs) coupled with open-source social software tools potentially provide the basis for enhancing teaching and learning in virtually any discipline. The use of social software in education has gained a lot of recent interest (Alexander, 2006; Alexander *et al.*, 2006; Attwell, 2006; Bryant, 2006; Cych, 2006; Mejias, 2006; Wilson, 2006). Jafari, McGee & Carmean (2006) recently proposed a model for a next generation e-learning environment that integrates social software tools.

> Stakeholders across the spectrum want an anytime, all-the-time, personalized experience of teaching and learning – one that utilizes all the currently available social tools, intuitive tools, smart agents, and interactive environments of Web 2.0 and social computing. In short, faculty, students, and administrators are waiting for an e-learning environment that is smart, environmental, archival, multi-modal, collaborative, and mobile (Jafari et al., 2006).

The popularity of these social, web-based tools is demonstrated by the design and support of current and soon to be released consumer mobile devices. An example is the inclusion of RSS news reading capability into Nokia (Nokia Lifeblog 2.0) and Sony Ericsson cell phones, and the Sony PSP. The next generation of Sony Ericsson cell phones will feature integrated mobile photo blogging (Gohring, 2006), and Nokia’s N73 cell phone allows direct posting of captured photos to Flickr. Additionally, the two ‘giants’ of the Internet, Google and Yahoo, are both positioning themselves for the wave of wireless mobility by developing a suite of mobile social networking tools (see http://mobile.google.com and http://mobile.yahoo.com).

Wireless mobile devices

E-learning tools have been established as valuable enhancements to both distance and face-to-face tertiary education, particularly in facilitating collaborative, reflective, student-centred learning environments (JISC, 2004).

> A review of current practice suggests that mobile and wireless learning is the natural next step wherever institutions and practitioners have already adopted e-learning (Knight, 2005).

Wireless mobile devices include: the new wireless enabled ultra mobile PCs (UMPC Community, 2006), cell phones, smart phones, PDAs, and wireless enabled portable media devices. While the use of wireless laptops has been well established (but still mostly in an ad hoc mode within the tertiary education scene), today’s WMDs potentially provide all the processing power and communication applications that students need, at a lower cost, greater portability and longer battery life than a laptop computer. Additionally, a WMD is not made redundant by a laptop or desktop computer, but is usually designed to complement them. A recent wireless mobile device trial at Unitec indicated that the key aspect of wireless mobile device utilization is their connectivity. Students value anytime anyplace connectivity with classmates, lecturers, and resources.

Pedagogical framework

Teaching and learning innovations are best implemented when informed by learning theory. A pedagogical framework for implementing social software tools via wireless mobile devices can be developed by drawing on concepts from constructivism, social constructivism, communities of practice, and a conversational model. There are many resonances between the use of social software in education and the development of communities of practice. Lave and Wenger assert that passive community members learn from the active members of the community, and are gradually brought into an active role in the community. This is termed legitimate peripheral participation. Attwell (2006) draws a comparison between the concept of legitimate peripheral participation and Vygotsky’s (1978) zone of proximal development. Wenger also introduces the concept of the technology steward as a key catalyst in this process.

The technology steward

The 'technology steward' (Wenger et al., 2005) is a member of the community with a grasp of how and what technologies can enhance the community. They act as a guide to the rest of the community as the community learns to utilize and benefit from technology. The role of the technology steward is seen as critical to the success of integrating the use of WMDs and social software in education. The idea of communities of practice also provides some theoretical frameworks for guiding the choice of technologies in a learning situation. In education, the technology steward role would most beneficially be that of the teacher. However when the teacher is not up to speed with the technology utilized by the community, or does not engage with it, then the technology steward role defaults to someone else within the community or class. The problem then is the potential for the community or class to go off on a tangent, from lack of pedagogical guidance. To facilitate the technology steward role in each of the research trials, the researcher will act as an assistant technology steward to the teacher of each group of students, and communities of practice will be established.

Implications for practice

To summarize: Wireless networks have been described as 'disruptive technologies', and so have the social tools that have developed (blogs, wikis etc…) (Alexander, 2004; Fielder, 2004; Lamb, 2004). Their disruptive nature forces a rethink of pedagogical strategies and relationships in education. Wireless mobile computing facilitates the development of collaborative learning communities, enhancing student–student and student–tutor communication and interaction. Wireless Mobile Devices coupled with open-source social software tools potentially provide the basis for enhancing teaching and learning in virtually any discipline. Below we suggest four possible scenarios for utilizing social software with different wireless mobile devices (Table 1). Further details and ideas for implementation can be found at http://ltxserver.unitec.ac.nz/mediawiki/index.php/MlearningOverview. The author's wiki page also provides an overview of the various technologies involved, and more ideas on using social software on mobile devices. The outcomes of these trials will be the subject of future papers.

Table 1: WMD trials

Trial	Course	Participants	WMD	Social software	Summary
1	Diploma of Landscape Design, Unitec	18 students, 2 academic staff, researcher.	Palm TX with folding wireless keyboard for text entry	Moodle Splashblog.com Litefeeds.com Blogger.com Letmeparty.com AIM, MSN	Use of WiFi PDA to create reflective Blogs. Group members subscribe to each other's blogs and to a central course blog using an RSS reading Java application. Deliver basic course content via Moodle, and encourage students to experiment with capabilities.
2	Year Two, Bachelor of Product Design, School of Design, Unitec	18 students, 2 academic staff, researcher.	Palm TX paired with a bluetooth 3G mobile phone	Moodle, Elgg Splashblog.com Blogger.com Litefeeds.com Letmeparty.com AIM, MSN	Use a combination of a WiFi PDA paired with a bluetooth enabled 3G-cell phone, for anywhere, anytime connectivity to social software tools. Students establish reflective blogs, subscribe to each other's blog via RSS, and upload photos to splashblog.com.
3	Year Three, Bachelor of Product Design, School of Design, Unitec	18 students, 2 academic staff, researcher.	WiFi & 3G enabled UMPC – e.g. Samsung Q1	Moodle, Elgg Blogger.com Flickr.com Meebo, AIM, MSN Newsgator.com Pbwiki.com YouTube	Use a WiFi enabled UMPC (Ultra Mobile PC), with 3G data card for connectivity beyond WiFi access points, interacting with the full range of social software options – including online newsreading, video uploading via YouTube, and instant messaging options.
4	School of Sport, Unitec	18 students, 2 academic staff, researcher.	WiFi & 3G enabled Palm Treo	Moodle, Elgg Splashblog.com Blogger.com Litefeeds.com AIM, MSN	Use a WiFi/3G 'smart phone', for anywhere, anytime connectivity to social software tools – as in Trial 1, but with the flexibility of 3G roaming.

References

Alexander, B. (2004, September/October). Going nomadic: Mobile learning in higher education. *Educause Review*, *39*, 28–35.
Alexander, B. (2006, March/April). Web 2.0: A new wave of innovation for teaching and learning? *Educause Review*, *41*, 33–44.
Alexander, B., Brown, M., Doogan, V., Johnson, L., Levine, A., Sabean, R., et al. (2006). *The horizon report 2006 edition*: A collaboration between The New Media Consortium and the Educause Learning Initiative.
Attwell, G. (2006). The wales-wide web. *What is a PLE? The future or just another buzz word?* Retrieved 1 July, 2006, from http://www.knownet.com/writing/weblogs/Graham_Attwell/entries/6521819364
Bijker, W., Hughes, T., & Pinch, T. (Eds.). (1987). *Social construction of technological systems: New directions in the sociology and history of technology*. Cambridge: MIT Press.
Bryant, T. (2006). Social software in academia. *Educause Quarterly*, *2*, 61–64.
Cych, L. (2006). Social networks. *Emerging Technologies for Learning* Retrieved 6 April, 2006, from http://www.becta.org.uk/corporate/publications/
Fielder, S. (2004, June 24). *Introducing disruptive technologies for learning: Personal webpublishing and weblogs*. from http://static.cognitivearchitects.com/gems/Seblogging/EdMediaSymposium.pdf
Gohring, N. (2006, February 28). *Sony ericsson unwraps 3.2-megapixel blogging phone*. Retrieved March 1, 2006, from http://www.macworld.com/news/2006/02/28/sonyericcson/index.php?lsrc=mwrss
Jafari, A., McGee, P., & Carmean, C. (2006). Managing courses, defining learning: What faculty, students, and administrators want. *Educause review, July/August*, 50–70.
JISC. (2004). The e-learning advantage. *Effective practice with e-learning*, 2006, from http://www.elearning.ac.uk/effprac/html/e_intro.htm
Knight, S. (Ed.). (2005). *Innovative practice with e-learning: A manager's planning tool for use of mobile and wireless technologies* (Vol. 2005). Bristol: JISC.
Kukulsa-Hulme, A., & Traxler, J. (Eds.). (2005). *Mobile learning*. Oxon: Routledge.
Lamb, B. (2004). Thewayitwasmeanttobe. *Educause review, September/October 2004*, 36–48.
Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
Mejias, U. (2006). Teaching social software with social software. *Innovate*, *2*(5).
O'Reilly, T. (2005). *What is web 2.0: Design patterns and business models for the next generation of software*. Retrieved March, 2006, from http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html
Traxler, J., & Kukulsa-Hulme, A. (2005, 25–18 October). *Evaluating mobile learning: Reflections on current practice.* Paper presented at the mLearn 2005, Cape Town.
UMPC Community. (2006). Umpcommunity. Retrieved 9 March, 2006, from http://umpc.com/
Vygotsky, L. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.
Wenger, E., McDermott, R., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Boston: Harvard Business School Press.
Wenger, E., White, N., Smith, J., & Rowe, K. (2005). *Technology for communities*. Retrieved 14 July, 2006, from http://technologyforcommunities.com/
Wilson, S. (2006, 17 March). Remixing elearning. Retrieved 11 April, 2006, from http://www.cetis.ac.uk/members/educational_content/past_meetings/16th_Meeting

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Argumentation and text-based conferencing: Who is learning and what is being learned?

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This paper focuses on the use of computer mediated communication (cmc), specifically text-based asynchronous conferencing. It reports on two small scale studies which investigated its use as a medium for developing students' argumentation skills. The first study focused on a postgraduate distance program in Applied Linguistics whilst the second study focused on an undergraduate distance program in Health and Social Welfare. Both programs were delivered by the Open University, UK and students represented a diverse population with regard to age, ethnicity, educational achievement and geographical location.

The paper discusses the use of a linguistic framework to investigate how teachers and diverse communities of students are using cmc to develop new ways of exchanging views on academic ideas and issues. Argumentation was focused on because a fundamental aim of education is to develop in students a critical attitude towards knowledge, and the ability to engage in reasoned debate (Terenzini, Spinger, Pascarella, & Nora, 1995). Claims have been made that asynchronous conferencing is particularly effective in enabling students to reflect on, elaborate and challenge ideas put forward. The suggested framework allows researchers to systematically examine such claims and to gain insight into individual and collective processes of argumentation and learning.

Keywords: computer mediated communication, asynchronous text-based conferencing, distance education, linguistic framework, argumentation

Asynchronous text-based conferencing

Over the last decade, conferencing using asynchronous text-based computer-mediated communication (hereafter electronic conferencing) has come to be recognized as a useful pedagogic resource for developing students' skills in argumentation (Andriessen, 2006). By argumentation, we mean the ability to present well supported and reasoned claims as well as to engage with alternative points of view – challenging, critiquing, reinforcing or defending them where appropriate. Certainly asynchronous conferencing offers students greater time for reflection than ephemeral, face-to-face seminar discussions. As Andriessen (2006; p.199) puts it, electronic conferencing can be described as a 'slow discussion' in which students 'can broaden and deepen their insights about important issues' and educators can 'monitor progress at a relatively slow pace'. Claims about the benefits of electronic conferencing nevertheless remain contentious (Joiner and Jones, 2003).

Also problematic are the existing frameworks for analyzing argumentation in electronic conferencing, most prominently content and interaction analysis. Content analysis, for example, does not provide a picture of how the views put forward by participants are interconnected, which is an important feature of argumentation. Although, in contrast, interaction analysis is designed to do this, nevertheless the perceived nature of the relationship between messages is restricted to *agreement* or *disagreement* and whether these are grounded in evidence, or not. Thus the analysis does not encompass other types of connections between the phases of the argument, for example whether a contribution is an expansion of a previous claim.

The aim of this article therefore is to:

- report on an evolving linguistically informed framework of analysis which, based on earlier work (Coffin, Painter, and Hewings, 2005), is designed to capture the dynamic nature of argumentation within an electronic conferencing environment;
- discuss how the framework can provide insight into individual and collective processes of argumentation and learning and generate recommendations for pedagogical practice.

The research context

Within distance education programs such as those delivered at the Open University, UK, electronic conferencing has become a common means of creating a virtual learning community – bringing together students, otherwise separated by time and geography, to engage with course content at a time of their choosing. Although the purpose of such conferences may vary, in the social sciences and humanities they are often used as a forum for students to exchange their views and perspectives on contentious issues and ideas. We have been funded, initially by the Open University and subsequently by the UK Higher Education Academy, to investigate how effective such forums are for developing students' argumentation skills. Given that that one of the fundamental aims of higher education is to develop in students a critical attitude towards knowledge, including an ability to engage in effective processes of argumentation, this is an important task. To what extent can electronic conferencing provide a means for students to develop such skills? Are lecturers and students who may be relatively inexperienced users of the technology making the most of its affordances?

To date, we have explored two different courses: a postgraduate distance course in Applied Linguistics and an undergraduate distance course (Complementary and Alternative Medicine) in Health and Social Welfare. Both are one year, part time courses in which large cohorts of students are placed in relatively small tutor groups (between 15-20 students). Each group is allocated a tutor who is responsible for conducting several electronic conferences throughout the year. Tutors are provided with tasks for the conferences but are able to tailor these in relation to the needs of their particular group. However, our interview data revealed that new tutors in particular have difficulty conceptualising a tutorial which lasts for days rather than hours and although they are given technical training in the use of the conferencing software (the commercially available *FirstClass* asynchronous system) they are provided with little input in terms of strategies for generating and fostering effective discussion and debate. This is largely because the technology is often as unfamiliar to the course organizers as it is to tutors. Discussions therefore tend to be handled in similar ways to those that would take place in face-to-face seminars. Nevertheless, at the start of a conference, students may be given considerable guidance as to how they might contribute to the discussion, perhaps more so than in a face-to-face discussion. Below is a sample task taken from a conference connected to the Complementary and Alternative Medicine course.

Conferencing task

For this tutorial try and respond to the question:

How realistic are the assumed benefits of statutory regulation?

Please keep these initial messages short (100 words or so) so that everyone gets a chance to read them fairly quickly. You might look at one benefit and consider whether it will fulfil its objective, or you might consider whether there might not also be some negative effects. Or you might like to think about the difference between the benefits and losses of statutory regulation and self regulation. It is the former which osteopathy and chiropracty already have? What do they think about it now it's happened? It's the latter which homeopathy, acupuncture and herbalism are currently seeking to formalise, with the encouragement of FIM. How do their practitioners feel about it?

As in previous tutorials, don't worry if other people have put up initial messages very similar to yours – the main thing is to share some ideas as a starting point for the discussion. You may then find that reading other group members' messages inspire you to think of other things so feel free to post them.

Please keep coming back to this tutorial as often as you can, and respond to at least one message. Your responses might be simply 'conversational', as if you were sitting in a tutorial together, or might include references to course materials or outside sources which you feel to be relevant to your comments. I will be putting up for you in a few days the thoughts of an osteopath about the effects of regulation and some info. about the discussions currently taking place around regulation within the homeopathic profession. I hope you will all feel able to make some contribution, whether it's agreeing with others, quoting a source you have found, expressing your own feelings or entering into controversy. Remember this is not in any way a test. It's an opportunity to explore ideas and information as you prepare your fourth assignment.

To date, we have collected data from conferences taking place at the beginning and towards the end of each of the courses and we have analysed in some detail four different tutor groups within the larger cohorts belonging to each course. This has enabled us to compare the dynamics of groups with similar mixes of students, following the same tutorial tasks. Combined with interview and questionnaire data, it has given us some important insights into the impact of tutor role and strategy and some of the different ways both tutors and students are learning to use the technology.

Framework of analysis

Our research draws on functional linguistics (Halliday, 2004). Functional linguistics provides analytical tools for systematically analyzing the overall structure of an interaction and patterns of language use. Linguistic descriptions of the way in which language is used to achieve educational goals can be used in pedagogic interventions. Tutors and students can be made aware of more and less effective dialogue (Coffin and Hewings, 2005).

Drawing on the analytical tools of functional linguistics we have developed a framework for mapping the typical moves made by tutors and students in the course of debating ideas and concepts in electronic conferencing. A simplified version is set out in Table 1. We use moves such as those illustrated here to analyse conference interactions. With the aid of excel software we are able to track the interconnection of one move to another. For example, each new claim (arguable proposition) is numbered and any related move (such as counter argument or a challenge) is tagged with the same number.

Table 1: Argument moves in electronic conferencing

Argument	**Recognition features**	**Examples**
Thesis	An overall position on an issue (at a higher level of generality than a claim) is put forward (i.e. a thesis statement)	*The pursuit of statutory regulation may be based on a number of assumptions about the perceived benefits that statutory regulation would offer complementary therapies.*
Claim	A contestable proposition relating to how things are (analytic)	*I think a community consists of the people in it and the relationships you make.*
Recommendation	A contestable proposition relating to how things should be (hortatory), what actions people need to take	*It would be good to take the best of orthodox and CAM therapies and give patients a real choice.*
Counterclaim	A claim which takes an alternative position to a previous claim	*I don't think the therapy needs to become biomedical, but it could carry out 'clinical tests' to prove it is safe and effective – even if the underlying reasons cannot fully be explained scientifically.*
Support	A claim is supported through evidence or reasoning (e.g. the use of academic experts, personal and professional experience etc.)	*Fulder suggests that statutory regulation for such therapies may not be appropriate.*
Agreement	A previous claim is confirmed by a participant agreeing with it	*I agree there is much more information about CAM available giving us greater choice.*
Challenge	A questioning or criticism of an argument or claim made in a previous turn, (or in a forum outside the conference such as a text book, academic article etc.)	*Why would the NHS necessarily mean long hours and less pay? Surely, the therapist could remain independent and work to suit and maybe even charge the same as private work.*
Concession	Recognises the validity of an alternative viewpoint whether expressed in the discussion or in another context, or anticipated by the writer.	*The NHS may have its faults but …*
Argument prompt	A question designed to stimulate and prompt participants' views on an issue	*Are communities now also linked to time as we continually move, breaking old relations and creating new?*

Conclusion

Analysis using the linguistic framework displayed in Table 1 makes it possible to generate a schematic representation of the shape of a conference discussion, to ascertain which claims are picked up and lead to a sustained discussion, which are left hanging, which ones provoke challenging moves and so on. We can also track individual student participation to establish whether, for example, certain students favour certain moves and whether they are actively involved throughout a discussion. The same applies to tutor moves. Currently, analysis from the Applied Linguistics data and preliminary analysis from the Complementary and Alternative Medicine course suggests the following are key points.

Tutors need to:

- develop a clear understanding of the purpose/s of electronic conferencing both for themselves and their students
- design/tailor discussion tasks that are a) motivating in their choice of topic b) clear and focused and c) likely to trigger a range of positions on an issue
- ensure that they model for students a wide range of moves (i.e. are not limited to Argument Prompt, Agreement)
- develop students' meta-awareness of the process of effective argumentation e.g. the cumulative, sustained collaborative support for, or challenge of, a position on an issue, careful reflection on the group's positioning and repositioning on an issue, appropriate and effective use of different types of support for a claim

Students need to:

- develop their ability to put forward Counterclaim and Challenge moves rather than be restricted to making claims, agreeing and/or adding support to a claim
- develop an understanding of how different types of support for a claim may vary in different disciplines and in different media (for example, the use of personal experience may be valid in an informal conferencing discussion but may be less appropriate in a formal, written assignment)
- learn to reflect on the direction a discussion is taking/has taken and have the intellectual flexibility to develop (where appropriate, and as an outcome of sustained engagement with a topic) a new position on an issue

As we continue to analyse data in new conferences and in different disciplinary areas, our framework is likely to further evolve. Findings and recommendations emerging from the use of such a framework in different disciplines and different educational levels will be the focus of future research and papers.

References

Andriessen, J. (2006). Collaboration in computer conferencing. In A. M. O'Donnell, C. E. Hmelo-Silver & G. Erkens (Eds.), *Collaborative learning, reasoning, and technology* (pp. 197–231). Mahwah, NJ: Lawrence Erlbaum Associates.

Coffin, C., & Hewings, A. (2005). Engaging electronically: using CMC to develop students' argumentation skills in higher education. *Language and Education, 19*(1), 32–49.

Coffin, C., Painter, C. and Hewings. A. (2005). Argumentation in a multi party asynchronous computer mediated conference: a generic analysis. *Australian Review of Applied Linguistics* Special Edition (S19) Language in Social Life: Functional Perspectives. pp. 41–63.

Halliday, M. A. K. (2004). *An Introduction to Functional Grammar* (Third Edition ed.). London: Edward Arnold.

Joiner, R., & Jones, S. (2003). The effects of communication medium on argumentation and the development of critical thinking. *International Journal of Educational Research, 39*(8), 861–871.

O'Donnell, A. M., Hmelo-Silver, C. E., & Erkens, G. (2006). *Collaborative Learning, Reasoning, and Technology*: Lawrence Erlbaum Associates.

Terenzini, P. T., Spinger, L., Pascarella, E. T., & Nora, A. (1995). Influences affecting the development of students' critical thinking skills. *Research in Higher Education, 36*(1), 23–39.

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An in-depth case study of students' experiences of e-Learning – how is learning changing?

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This paper describes some of the findings which have emerged from an in-depth case study exploring students' experiences of e-learning. The main research theme of the project was to collect learner stories on their experiences with e-learning. Data was collected through an online survey, coupled with a series of in-depth case studies using student audio diaries and interviews. The study yielded both expected and unexpected findings in terms of students' use of technologies. The expected findings are useful in terms of providing valuable up-to-date empirical evidence of students' current learning environment. The unexpected findings give a hint of the student learning environment of tomorrow and have important implications for policy and practice.

Keywords: student experiences, student perceptions, e-learning, in-depth case studies, audio log, online survey

Introduction

A review by Sharpe, Benfield, Lessner & DeCicco (2005), showed that the learner perspective on e-learning had been largely overlooked, but that knowledge of how learners use and experience e-learning/technology in their learning activities was crucial for the development of tools, pedagogy and teaching practices. This paper reports on a project (The LXP project - students' experience of e-learning) which was funded by the Joint Information Systems Committee (JISC) in the UK and ran from January – August 2006. The main research questions addressed were: How do learners engage with and experience e-learning? (What is their perception of e-learning? What do e-learners do when they are learning with technology? What strategies do e-learners use and what is effective?), and How does e-learning relate to and contribute to the whole learning experience? (How do learners manage to fit e-learning around their traditional learning activities?)

The project was particularly interested in extrapolating out subject discipline differences in the use of technology and worked in conjunction with four of the UK's HE Academy subject centres: Medicine, Dentistry and Veterinary Medicine; Economics; Information and Computer Sciences; and Languages and Linguistics. These centres were chosen because they gave a good spread of subject areas and because they were centres who had a track record and interest in research on both the way in which students learn and the use of e-learning.

Sharpe et al. (2005) reviewed studies (post 2000) which purported to focus on students' experience of e-learning. They concluded that there was a scarcity of studies focusing on the learner voice (beyond that of simple course evaluations), far more emphasis appears to have been given to the practitioner perspective and on course design. They distilled out a number of overarching themes which emerge from their review of research studies on the students' experiences of e-learning. In terms of the student voice they highlight three aspects: *Emotionality* (students mixed views on the pros and cons of e-learning), *time management* (the contradiction between the tutor-centric view of the flexibility technologies afford and students' concerned about the additional time requirements), and *e-learning skills* (a wider range of skills than just

IT skills are needed for students to make most effective use of technologies to support their learning). In terms of the factors affecting the e-learning experience they highlight literature on the influence of the *tutor*, the influence of *pedagogy*, *learner differences* – gender, cultural, learner preferences, language, disability, etc, and *effectiveness as an e-learner*.

The ‘Learner Experience of e-learning’ or LEX project was carried out in parallel to LXP and was funded under the same JISC programme. Both LEX and LXP arose from the recommendations of the Sharpe et *al.* scoping study and were intended as initial pilot projects under the ‘understanding my learning’ strand of work. The focus of LEX was to ‘investigate learner’s current experiences and expectations of e-learning across the broad range of further, higher, adult, community and work-based learning (Creanor Trinder, Gowan, & Howells, 2006). The study focused on three main questions: characteristics of effective e-learners; beliefs and intentions; and strategies for effective e-learning. The findings led to the development of a conceptual framework which mapped five high level categories (life, formal learning, technology, people and time) against five influencing dimensions (control, identity, feelings, relationships and abilities). The SOLE project represented an important landmark project in terms of being one of the first to evaluate students’ experiences of Virtual Learning Environments (VLEs) (Timmis, O'Leary, Weedon, Harrison & Martin, 2004). Of particular interest is the discipline differences reported from the project. They noticed a marked difference between some subject areas in the roles of tutors and students.

Kirkwood and Price (2005) report on data spanning five years from evaluation data on students’ attitudes to and experiences of technologies. In terms of access to and use of ICT they suggest that there has been a fundamental shift in students’ access to ICT – arguing that this reflects not only attitudinal changes but the changing needs of society. Their meta-analysis shows that student access to, experience of and attitude towards technologies varies across subject disciplines and argue that: “Although students’ access to computers and to the internet is no longer considered an obstacle in some subject areas, there are still concerns in others (e.g. health and social welfare).” They also provide valuable insights into how students are using ICT in their studies, which mirror the findings reported here. For example they high use of generic software such as Word for preparing assignments and students habits in terms of using the internet to search for information and using a range of technology tools to communicate with peers and tutors.

Research methodology

The project adopted a methodology developed during a scoping study carried out by Sharpe et al. (2005), to collect data on learner experiences with e-learning. In general the research procedure was aimed at describing the learner’s personal background and (learning) context in which they integrate technology into their learning. The selection of learners was done in close collaboration with the participating subject centres, via tutors who have taken specific approaches, or were working in specific contexts. Learners who have been effective in their participation with e-learning were approached to capture their experience with e-learning.

The methodological approach consisted of two phases – a wider contextual review of the use of technologies across a broad spectrum of students using an online survey and a more in-depth series of case studies of technology use gathered through student audio log diaries and interviews. The online survey was used to gain a wider understanding of learners’ experiences around particular artefacts, whereas the case studies of individual learners (via the audio logs and interviews) included describing the nature of the e-learning activities carried out by the learner and exploring the e-learner context and background.

After the data had been cleaned up a total of 427 valid entries were received from the online survey. The survey was sorted according to subject centre and divided into qualitative and quantitative responses. Quantitative responses were imported into SPSS for analysis. 85 distinct audio recordings were collected. Audio recordings were sorted by subject centre and individual and coded indicating the subject centre/institution, individuals and the number of the message dropped. Audio logs were ordered and anonymised and a separate look up coding table created. A total of fourteen interviews were collected. Background information and notes were collected during each interview and the sessions were audio recorded. A cross table matching original log and interview details was created. Table one gives the breakdown of the data collected.

Table 1: Summary of data collected

Phase one – context		Phase two – case studies			
Survey		Audio logs		Interviews	
Economics:	128	Economics:	3	Economics:	2
Languages:	92	Languages:	47	Languages:	3
Medicine:	31	Medicine:	16	Medicine:	5
Computing:	158	Computing:	19	Computing:	4
Other:	18				
Total:	427	Total:	85	Total:	14

The combination of methods allowed for rich empirical data, as well as for the triangulation of interpretations of the data that result from the different methods and different individuals and groups targeted. The sampling strategy was to a degree pragmatic, working specifically with the four subject centres to identify appropriate courses and student cohorts to target.

A version of the questionnaire (http://www.geodata.soton.ac.uk/eLRC/learner_survey/) is available online. The survey covered a broad spectrum of technologies and contained a series of matrices of technologies against types of learning activities. These matrices drew on media types table developed by Laurillard (2002) and the definition of learning activities developed in the DialogPlus taxonomy (Conole, 2007; Conole & Fill, 2005) of learning activities as a basis for categorising types of technology and their use. The survey was initially developed by the project team. It was then improved in light of discussions with the four HE Academy subjects centres and finally via exposure to the JISC e-pedagogy group at a meeting on 22nd February 2006. The survey was sent out by the participating subject centres to reach a maximum number of students within their institutions. The survey was designed to be a mixture of qualitative and quantitative questions.

The second phase focused on the actual learning experiences. Based on the sampling strategy and the results of the survey, a selection of learners from across the subject centres were selected for in-depth case studies on their e-learning activities and experiences. Students were given an initial briefing by a member of the research team to outline the purpose of the study and their involvement. They were then asked to provide regular audio log diaries to demonstrate the different ways in which they were using the technology. To conclude the same member of the research team met again with the students and carried out a semi-structured interview to help contextualise and extend the findings emerging from the audio logs. Each student received fifty pounds as a token of gratitude for participating in the study.

The audio-logs were used to collect diaries on the students' learning activities over a period of time, when the students were engaged in their HE course. The use of audio-logs allowed the students to inform us each time they used some kind of technology to support their learning activities by leaving a phone message on our answering machine. It provided a means of gathering 'in-situ' use of technology on a daily basis which could then be interrogated in more depth in the follow up interviews.

Audio logs were chosen because such diaries can provide rich data about day-to-day events, as they happen, and contain a realistic account of the activities undertaken by the learners. Furthermore the outcomes of these diaries were then used to feed into the subsequent interview with the learner to reflect on the technologies they have used and the learning strategies that they have developed as a result. Previous research suggested that working with written diaries was useful but that these written diaries are often incomplete and participants usually find keeping diaries time consuming (Timmis et al., 2004). To overcome this we set up a server which students were able to ring and leave a message. Participants are asked to make short recordings during their activities about what they are doing.

At the end of each case study a selection of learners were interviewed across the four subject centres, the focus was on eliciting their experiences with integrating technology into the learning as is expressed in the main research questions. The interviews were held at the universities where the students were studying. A total of fourteen interviews were recorded. During the interview participants were asked to reiterate what kinds of technology they used during the audio log period. From this a series of semi-structured questions guided the conversations.

SPSS was used to analyse the quantitative data. Qualitative analysis was divided up into appropriate sections and manipulated in Excel. First a broad descriptive analysis was carried out across all the available data to see if some general patterns emerge. These patterns were then further analysed to see if there are differences between the participating subject centres. The qualitative data was then organized and coded according to emerging patterns and the results ranked, proportioned or directly quoted to support the quantitative findings. After gathering data on the level of individual students, the research team used several analytical methods to analyse each case study individually followed by an overarching study across the cases (study of cases). The central purpose of analysing qualitative data was to extract, generalise and abstract from the complexity of the data, evidence concerning e-learning activities and experiences in order the answer the main research questions. Relevant extracts from the interviews were transcribed and used to complement and extend the survey and audio logs findings. Importantly these extracts were used to provide more in-depth information about the strategies that the students used and how the technologies influenced their approach to learning and the impact this had on their daily lives.

Overarching findings

There were a number of both expected and unexpected findings arising from the data. In terms of expected findings the survey and audio logs confirmed that students used a range of basic software to support their learning – in particular Word and PowerPoint. Particularly for students studying numerical subjects, use of technology for data manipulation was also important and both Excel and more specialised statistical software were cited. Search engines were used extensively to find information and the Internet was clearly used by the majority as their first port of call for information. What was not expected but which did come across clearly from the data was the fact that students were using technologies in a variety of often very sophisticated ways to communicate with their peers and communication tools emerged as an important element in their strategies for learning – examples cited included using mobile phones, Instant messaging and discussion forums, as well as the expected use of email. One surprising result was that many of the students showed a marked lack of enthusiasm for VLEs (Virtual Learning Environments). Only one person mentioned a VLE as one of the four technologies they like to use most, and ten listed a VLE as a dislike. This could be interpreted as the institutional VLE being just taken for granted, or that it is seen as having relatively little value. However it is more likely to be because in those instances the VLEs are being used primarily as repositories for materials rather than being used in more imaginative ways to support learning. A further factor is evident with the Computer Science students who have a preference for building their own environments rather than using off the shelf packages.

Table 2 lists examples of the ways in which students are using technologies taken from the audio logs. It gives an indication of the rich and varied ways in which they are using technologies; the second half of this paper distills out the key findings in terms of how students learning strategies and practices are changing as a result of their use of technologies.

Table 2: Emergent practice in use of technologies

The internet as the first place to find information Internet sites to find meanings and glossary Mobile phone find out about course work MSN to send course work to friends Use of Google for keywords/phrase Use of Wikipedia for definitions and terms Listening to ‘expert’ lectures as podcasts Use of mobiles to communicate with other students – to share ideas or get missing information Course websites sometime deemed confusing Use of other students’ homepages for information Development of e-portfolios and links to own professional practice Use of mobile to text class mates to get exam hints Blogs for personal reflection

From the quantitative data on the survey a number of key overarching findings emerged. E-learning was cited as an important part of their course across all four subject domains (64% - Econ; 62% - Lang, 78% - Med; and 67% - Comp, agree or strongly agree). The response to the question 'With e-learning I interact more with other students' was lower across the disciplines (26% - Econ; 34 % Lang; 17% - Med; and 35 % - Comp, agree or strongly agree), perhaps giving an indication of the degree to which e-learning is embedded into the course design. E-learning was seen as an important tool for learning and was perceived as helping to make learning easier (67% - Econ; 62% - Lang; 60 % Med; and 57 % - Comp).

Emergent trends

Analysis of the data reveal a number of interesting results which give us a valuable insight into students' current practice in using technologies and their experiences. These are discussed here under five main headings which emerged from the data:

- Students use of technology for information purposes;
- Students use of technology for communicative purposes;
- The nature of students' environment in which they learn;
- Students perceptions of e-learning;
- Changing nature of practice.

Information

The first issue in relation to the use of information is that it is evident that students' perception of the nature of content is changing.

> The first thing I do when given any piece of word is type it into a search engine! This gives me the opportunity to see how different people interpret the title. From there I can focus on one main idea and use the electronic resources to support my initial findings or indeed rule them out. E-mail is always vital with communicating with different mediums. Teachers for support.

This is a consequence of the fact that information is available readily and usually free; it is perceived as therefore having lower intrinsic value. Students are also used to high presentation standards and increasingly expect a high degree of interactivity of materials. This raises fundamental questions about the value of content in institutions and the appropriateness and nature of assessment processes. The second issue relates to the cost and value of content. The data consistently showed that students were accessing a rich variety of free material, and that the internet was their first port of call for information. Their perception of the value of materials therefore is different – if information on anything is available freely and easily what is its value? The third issue relates to presentation of content. Students expect good quality material, which is interactive and engaging; however there is a mismatch between this expectation and what the majority of students are being given in their institutions. The final issue relates to the new literacy skills that the students need and are demonstrating. These include skills of evaluation and an ability to critique and make critical decisions about a variety of sources and content.

Communication

Students are using tools in a variety of different ways to communicate with friends, family, peers and tutors.

> I use email to communicate with everyone, especially lecturers; arranging meetings, asking questions about work and queries over assignments etc. I write all my assignments using Word and to sort through the information I find, make notes of what I still need to do, and spell check my emails that I'm sending to lecturers.

Search engines are used to find news articles. They also use the internet to access expert knowledge (which is an indirect form of communication) and have an expectation of being able to communicate with anyone, about anything, when they want to. New forms of collaboration are emerging both with peers and via new ‘smart’ and adaptive technologies, suggesting a shift towards Salomon’s (1992) notion of ‘distributed cognition’ and shared enterprise with tools.

Environment

The data revealed that the students are learning in a complex and changing environment, using a plethora of technological tools to support their learning: USB pens, ipods, mps players, integrated phones and specialized screen displays for reading were amongst the variety of tools cited.

> I use my laptop to store data and type my course works. The MP3 player serves as a storage media used to save most of my assignments, electronic journals and articles, while I use MS word application to type most of my course works. The electronic library gives me access to books, journals and articles all of which are important for my study

The survey data confirmed that this really is the ‘nintendo’ gaming generation (Morice, 2000) and that the boundaries between students’ use of technologies for learning and gaming are blurred. The rich, interactive and engaging environment of games however has lead to an increased expectation of similar levels of quality for learning materials. There is evidence that there is shift from passive to more interactive interactions across all aspects of their learning. Finally many now have their own PCs and wireless internet access and have become accustomed to being able to access information or contact people on demand, anywhere.

Perceptions

Students are evidently comfortable with using technology and see it as integral to their learning. They are generally sophisticated users, using technologies in a variety of different ways to support different aspects of their learning.

> I use them to find out information for assignments, and also to help me clarify my notes on each subject area that I study. Instant messaging is used to discuss issues with friends if a topic is not understood.

> I use the mobile phone and email to communicate with tutors and members of groups which I am in. The electronic library facilities to read online journals, reserve books and search for relevant texts and the word processing package to present my information.

They are critically aware of the pros and cons of the use of different technologies and ‘vote with their feet’ – i.e. they do not use technologies just for the sake of it – there needs to be a purpose and clear personal benefit.

> I don’t think I 'fit it around' other learning activities, I find to learn effectively I use them to complement each other i.e. searching elec. library to find a paper and then printing it off to read.

They don’t see the technology as anything special. It is just another tool to support their learning. Finally they have an expectation of being able to access up to date and relevant information and resources and see this as vital.

> Use it alongside traditional learning, sometimes do activities completely based on technology, but often use them together, i.e. research using books then write essay on laptop, or find an activity online, e.g. grammar exercise and print it off and do it as a hard copy.

Indeed a number of students found the whole idea of differentiating between ‘learning’ and ‘e-learning’ inappropriate.

> This is a silly question. We've been brought up using new technologies, and introducing new ones to our way of working as new technologies appear. It's not a case of "fitting around" it's just the way I work, using multiple methods, some "traditional", some e-learning

But throughout the findings about views on e-learning, its' importance in comparison with other forms of learning is mixed, depending on a complex range of factors such as personal preferences, experiences of technologies, relevance and peer/tutor pressure.

> One half of my course has really embraced e-learning and the other has not done so to the same extent; the side that has embraced it to a greater extent is a more organised school than the other.

Practice

The Web is unequivocally the first port of call for students – with extensive examples across the study of how students are using search engines, dedicated subject-specific sites, and e-journals to find information of relevance to their studies. What is surprising perhaps is the extent of this as a common practice amongst the students and the sophisticated ways in which they are finding and synthesising information and integrating across multiple sources of data. Similarly, technologies are used extensively by students to communicate with fellow peers and tutors, with students demonstrating use of a variety of tools (email, MSN chat, skype, mobile phones, etc.) to support a range of different communicative tools. Again, the level and type of communication is notable – there is strong evidence of peer support and peer community, reminiscence of the rhetoric inherent in the idea embedding in social networking and the world of Web 2.0 (O'Reilly, 2005). The key picture that emerges is that students are appropriating technologies to meet their own personal and individual needs– mixing use of general ICT tools and resources, with official course or institutional tools and resources.

The above findings point to a profound shift in the way in which students are working and suggest a rich and complex interrelationship between the individuals and the tools. The follow eight factors emerge from the data in terms of the changing nature of the way students are working:

1 *Pervasive and integrated:* Students are using technologies extensively to find, manage and produce content. They use technologies to support all aspects of their study. Students are using tools in a combination of ways to suit individual needs. There is evidence of mixing and matching. They are comfortable with switching between media, sites, tools, content, etc. They said that technologies provide them with more flexibility in terms of being able to undertake learning anytime, anywhere.
2 *Personalised:* They appropriate the technologies to suit their own needs. They use the computer, the internet and books simultaneously. Their learning is interactive and multifaceted, and use strategies such as annotation and adaptation of materials to meet their learning needs.
3 *Social:* Students are part of a wider networked, community of peers. They are members of a range of communities of practice - to share resources, ask for help and peer assess.
4 *Interactive:* Students' perception of the nature and inherent worth of 'content' is changing. They have access to a rich variety of free material and are increasingly expecting high quality, interactive and engaging materials of the type encountered in gaming environments. Content is no longer 'fixed' and 'valued', it is a starting point, something to interact with, to cut and paste, to adapt and remix.
5 *Changing skills set:* Students need and are demonstrating new skills in terms of harnessing the potential of technologies for their learning. These include developing skills of evaluation and an ability to critique and make critical decisions about a variety of sources and content. Students are becoming sophisticated at finding and managing information (searching and structuring).
6 *Transferability:* They see the PC as their central learning tool. They are used to having easy access to information (for travel, entertainment etc.) and therefore have an expectation of the same for their courses. There is evidence of the transfer of practices of the use of technologies in other aspects of their lives to the learning context, for e.g. MSN chat, Amazon, ebay and Skype.
7 *Time:* The concept of 'time' is changing – both in terms of expectation of information and results on demand. There is evidence of a fragmentation of the learning timetable.
8 *Changing working patterns:* New working practices using an integrated range of tools are emerging. The use of these tools is changing the way they gather, use and create knowledge. There is a shift in

the nature of the basic skills with a shift from lower to higher levels of Blooms taxonomy, necessary to make sense of their complex technological enriched learning environment.

Students are evidently comfortable with using technology and see it as integral to their learning. They are generally sophisticated users, using technologies in a variety of different ways to support different aspects of their learning. They are critically aware of the pros and cons of the use of different technologies and 'vote with their feet' – i.e. they do not use technologies just for the sake of it – there needs to be a purpose and clear personal benefit. They have an expectation of being able to access up to date and relevant information and resources and see this as vital. They do not see the technology as anything special, but see it as just another tool to support their learning.

Conclusion

The project tried to capture the ways in which learners are using ICT - both in formal and informal learning - for educational purposes and other aspects of their lives. What is transpiring from the audio recordings and the survey is that many learners see technology as integral to all aspects of their lives. A similar study found the main tool used for learning in small and medium enterprises (SMEs) was Google (Atwell, 2005), and that people with a prior qualification were more likely to use ICT for learning, regardless of what the course was. This raises the question of how people are constructing or scaffolding knowledge. Knowledge in the past was generally acquired through formal learning and it was structured by academic and curricular concerns. But if people are now gaining knowledge informally through communities of practice then how do they build on and develop knowledge?

Clearly new and different skills are needed and a lot of research has shown that despite the fact that learners are now IT-literate (and have experience of using technologies in their daily lives, interaction with games etc.) they are not academically e-literate and still lack the necessary skills to make appropriate critical use of information. The results suggest that different learners use a combination of different tools in different ways to meet their own personalised and individual needs; some students keep tools for learning and tools for leisure separate, whilst for others the boundaries of the use of mp3 players, MSN chat etc. are more blurred. The tools appear to be used as appropriate for specific tasks, for example, some learners appear to separate their communication channels into work and leisure by having separate email accounts. Technology is constantly re-invented to support learning activities and there is a complex co-evolution of tools and their use. This has resulted in significant changes in the way that students are learning, which we need to take account of in the way we support learning and the institutional environments we provide.

References

Attewell, J. (2005), Mobile technologies and learning: a technology update and m-learning project summary. www.lsda.org.uk/cims/order.aspx?code=052232&src=XOWEB [viewed 16 Oct 2006].

Creanor, L., Trinder, K., Gowan, G. & Howells, C. (2006). *LEX: The learner experience of e-learning - final project report,* August 2006. Report under the JISC e-pedagogy understanding my learner programme. Glasgow: Glasgow Calendonian University.

Conole, G., & Fill, K. (2005). A learning design toolkit to create pedagogically effective learning activities. *Journal of Interactive Media Education,* http://www-jime.open.ac.uk/2005/08/conole-2005-08-paper.html [viewed 16 Oct 2006].

Conole, G. (2007). Describing learning activities and tools and resources to guide practice. In H. Beetham & R. Sharpe (Eds), *Rethinking pedagogy for a digital age: Designing and delivering e-learning.* London: Routledge Falmer.

Lauriallard, D. (2002). *Rethinking university teaching – a framework for effective use of learning technologies*. London: Routledge Falmer

Morice, J. (2000). *Skills and preferences: learning from the Nintendo generation.* International Workshop on Advanced Learning Technologies: Design and Development Issues. Palmerston North, New Zealand, IEEE.

O'Reilly, T. (2005). *What is web 2.0: Design patterns and business models for the next generation of software*, http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html [viewed 16 Oct 2006].

Salomon, G. (1993). *Distributed cognitions—psychological and educational considerations.* Cambridge: Cambridge University Press.
Sharpe, R., Benfield, G., Lessner, E., & DeCicco, E. (2005). *Final report: Scoping study for the pedagogy strand of the JISC learning programme.* Unpublished internal report 4(1) JISC.
Timmis, S., O'Leary, R., Weedon, E., Harrison, C., & Martin, K. (2004). *Different shoes, same footprints? A cross-disciplinary evaluation of students' online learning experiences: preliminary findings from the SOLE project.* JIME 13, http://www-jime.open.ac.uk/2004/13/ [viewed 16 Oct 2006].

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Analysing online discussions: What are students learning?

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Online asynchronous discussions (OADs) are increasingly advocated to encourage interaction in blended learning in higher education. However, questions remain over the educational utility of OADs. In particular, relatively little is known about how students use online discussions and the ways and extent to which their use enhances learning. Previous research seeking to investigate the correlation between discussion board use and exam results has proved problematic and open to misinterpretation. Analysis of the content of online discussions may provide a more fruitful way of discovering the impact on student learning, but this approach can appear overly complex and time-consuming. This paper describes a small scale research project which pilots a number of different methods for analysing online discussions and considers the advantages and disadvantages with each approach, both in terms of methodological simplicity and utility of findings.

Keywords: web-based education, online discussion, blended learning, student learning, social presence

Introduction

Online asynchronous discussions (OADs) are increasingly used in higher education, often as part of a blended learning approach combining computer mediated and face to face interaction. Computer mediated discussions have the potential to provide opportunities for interaction and collaboration between learners, and to encourage informal peer or tutor-led learning opportunities at a number of levels. This offers the advantage of enabling interaction at a time and place convenient to the learner, and of supporting reflection on face-to-face sessions. However, the ways in which students engage in online discussions are likely to influence the learning outcomes achieved, and research which focuses on actual use of OADs (as opposed to an ideal view of what they might be used for) is therefore crucial.

It has been argued that online learning encourages wider student participation and increases interaction between students when compared with traditional programmes. However, the evidence of impact on student learning is far from clear-cut. Davies and Graff (2005) examined the frequency of online interactions of a group of undergraduate students and compared this with their end of year grades. Their findings suggested that greater online interaction did not necessarily translate into higher grades – although they did find that students who failed in one or more modules had interacted less frequently than those who passed. However, interpretation of these findings is problematic: Is it simply that the more able or strongly motivated students contributed more substantively to online discussions? Was it the case that those with a limited understanding (who subsequently failed) interacted less because they were already struggling with the subject area? These kinds of correlations, we believe, cannot give definitive answers to the question of the impact of online engagement on student learning. We suggest that a more fruitful approach to assessing the educational utility of OADs is to investigate and analyse the content of online discussions with respect to student learning.

Methodology

A number of authors have developed theoretical models of student learning through online discussion, and it is these theories which guide the current study. Previous research on online discussions has drawn upon a variety of methods, from simple counting of frequency of contributions (Davies & Graff, 2005); analysis of student perceptions of social presence (Richardson & Swan, 2003); or individual or team categorisation of statements within postings (Gilbert & Dabbagh, 2005; Murphy, 2004).

In this research, we piloted three different methods of analysing online discussions, in order to investigate the following questions:

- How easy is each method to implement?
- Do any methodological problems arise?
- To what extent does each method provide reliable and valid data about student learning?

The OAD used for the purposes of analysis was a recent online conference used to support the General Teaching Associates (GTA) course at the University of Plymouth in the United Kingdom. The GTA programme aims to support new and part time teaching staff (such as graduate students with limited teaching responsibilities). Successful completion of this 20 credit level 3 module leads to Registered Associate Practitioner status with the UK Higher Education Academy. Participants in this study were 17 GTA students and five tutors, and online discussions were based around specific tasks and activities. This particular version of the GTA course involves online activities scheduled between the taught sessions, and involvement in the online discussions is a required part of the course. Discussion comments posted by individuals receive formative assessment from peers and tutors, but are not subject to summative assessment.

Participants and tutors on the GTA course were invited to be involved in the research at the start of the programme, and their consent was obtained for use of the discussion transcripts. Ethical approval was obtained following standard university procedures, and an ethics protocol was developed.

Analysis of OADs

A sample of conversations from the March 2006 GTA conference were selected for use in the analysis. The aim was to utilise a variety of discussions involving both students and tutors, based around three specific activities and the generic learning log. The activities included discussions around 'learning styles', 'difficult situations' and 'assessment'. Within each of these strands and the learning log we selected two conversation threads to analyse. The criteria for selection were that conversations should contain postings by two or more participants, at least one of whom must be a tutor. In total therefore, eight conversation threads were analysed. More detail about each conversation is given in Table 1.

Table 1: Summary of participants and postings in selected conversation threads

Discussion Thread	Student participants	Tutor participants	Total participants	Student postings	Tutor postings	Total postings
Learning Styles 1	2	1	3	3	1	4
Learning Styles 2	3	1	4	5	1	6
Difficult Situations 1	3	2	5	3	2	5
Difficult Situations 2	4	2	6	8	2	10
Assessment 1	2	1	3	4	1	5
Assessment 2	2	1	3	4	2	6
Learning Log 1	5	1	6	6	1	7
Learning Log 2	3	1	4	4	1	5

The three methods of analysis piloted in this study were (i) analysing social, teaching and cognitive 'presence'; (ii) content analysis based on Bloom's taxonomy; and (iii) Quantitative analysis based on intended learning outcomes.

Method 1: Analysing social, teaching and cognitive 'presence'

Garrison, Anderson and Archer (2000) describe a model depicting three key dimensions of the learners' educational experience when using text based computer conferencing. These are *cognitive presence* (the extent to which participants can "construct meaning through sustained communication"), *teaching presence* (the design of the learning experience and facilitation both by tutors and students during a discussion) and *social presence* (the ability of participants "to project their personal characteristics into the community"). They assert that when teaching and social presence are both high, there is a positive impact on cognitive presence leading to effective learning and enhanced academic performance. This claim is supported to some extent by Volet and Wosnitza (2004) who maintain that a strong sense of social presence contributed to the level of engagement amongst participants in their study of online discussions. However, Murphy (2004) explored the potential for student collaboration through online discussion, and found that participants engaged mainly in processes related to social presence and individual perspectives, concluding that more explicit scaffolding was required in order to encourage a stronger cognitive dimension. Our research involved an investigation of different aspects of 'presence' via an analysis of textual units drawn from an online discussion of students on the GTA programme. Based largely on the work of Garrison et al. (2000), we focused on three broad themes of social, teaching and cognitive presence, using the indicators outlined in Table 2.

Table 2: Indicators of presence (adapted from Garrison et al., 2000)

Aspect	Indicators
Teaching Presence	Selection, organisation, and primary presentation of course content The design and development of learning activities and assessment Facilitation (teacher and student)
Social Presence	Emotional expression Projection of personal characteristics
Cognitive Presence	Sharing of knowledge and ideas Negotiation of conflicting views

Using these indicators as broad themes, we categorised textual units posted in the online discussion, with each transcript being coded independently by two researchers in order to compare findings and gauge levels of inter-rater reliability. We calculated the quantity of each aspect in different conversation threads to investigate the relative densities of teaching, social and cognitive presence.

Method 2: Content analysis based on Bloom's taxonomy

This approach follows the methodology utilised by Gilbert and Dabbagh (2005) in their analysis of online discussions. These researchers created a coding scheme which assessed whether students were:

1. Relating new knowledge to prior knowledge
2. interpreting content through the analysis, synthesis and evaluation of others' understanding
3. making inferences

Codes used in this research are listed in Table 3 together with the mapping to Bloom's taxonomy (Bloom, 1956) suggested by the authors. This coding scheme was also piloted independently by two researchers in order that inter-rater reliability could be assessed.

Table 3: Coding scheme based on Bloom's taxonomy (adapted from Gilbert & Dabbagh, 2005)

Code name	Brief definition	Bloom's taxonomy reference
Reading Citation	Citation of set reading, e.g. reference to article or chapter by learner	Knowledge
Content clarification	Personal interpretation of content, e.g. paraphrasing concept or principles	Comprehension
Prior knowledge	Use of prior knowledge and outside resources to support statement	Comprehension
Real world example	Citing personal experience (professional/ academic) to demonstrate application to real-world context	Application
Abstract example	Use of analogies, metaphors or philosophical interpretations to support understanding	Application
Making inferences	Going beyond information given: beyond comprehension - adding or constructing new knowledge	Analysis, synthesis and evaluation
Facilitator question	Question posted by facilitator	n/a
Facilitator response	Response posted by facilitator	n/a
Facilitator clarification	Clarification posted by facilitator	n/a
Instructor posting	Messages posted by the instructor	n/a

Method 3: Quantitative analysis based on intended learning outcomes

To provide a simple comparison with the fairly complex coding schemes outlined above, we utilised a straightforward quantitative word-count method to assess the quantity of on-task discussion (i.e. that which directly related to the learning outcomes for that task), using the same OADs as above. This method involved simply counting the number of words in each discussion which were deemed to address the intended learning outcomes (as judged by two independent researchers). This was intended to provide a basic measure of the quantity of on-task discussion to compare with the two previous coding schemes which looked at differing aspects of quality of discussion.

An example of coded text illustrating all three methods is provided below. The learning outcomes for this activity asked learners to:

- Describe the VARK questionnaire and their results
- analyse their results in the light of their approaches to learning
- identify implications for their approaches to teaching.

Table 4: Example coding of student posting using 3 methods (Researcher 1)

Conversation Text	Coding Method 1	Coding Method 2	Coding Method 3
Hi	Organisational	Organisational	Off-task
Do you mean that you like to be very interactive with the students? Sharing love and joy in learning.	Cognitive presence	Off task	Off-task
I relate to this and I see the lab as a good place for student interaction.	Cognitive presence	Content clarification (personal interpretation)	Off-task
I have had good feedback from the students, not based on my knowledge of subject but on how I relate to them.	Cognitive presence	Real world example (personal experience)	Off-task
For me to become a lecturer would be interesting, I would have to bring the same interaction to the classroom.	Cognitive presence	Content clarification (interpretation of content)	On-task
The lab is definitely my environment, yet the lecturers give the labs to me because they hate labs.	Cognitive presence	Real world example (personal experience)	On-task
It is also the best place to judge the students abilities, exams are just about memory. Labs require students to demonstrate their skills and is similar to their future workplace.	Cognitive presence	Prior knowledge	Off-task
Sorry I have drifted off-topic a bit.	Social presence	Off-task	Off-task
Regards	Organisational	Organisational	Off-task

Results

The focus of this section is to illustrate the type of data produced via the three different methods (methodological issues are addressed later in this paper).

To recap, three questions guided this study with respect to the analysis of online discussions:

- How easy is each method to implement?
- Do any methodological problems arise?

- To what extent does each method provide reliable and valid data about student learning?

Method 1: Analysing social, teaching and cognitive 'presence'

This method of analysis produced a reasonable level of inter-rater reliability, with both researchers classifying the majority of the conversation as 'cognitive presence', some as 'social presence' and very little as 'teaching presence' (Table 5).

Table 5: Percentage of conversation in each category

Conversation	Teaching R1 %	Teaching R2 %	Cognitive R1 %	Cognitive R2 %	Social R1 %	Social R2 %
Assessment 1	6.3	6.3	78	64.3	15.5	29.2
Assessment 2	9.0	4.1	84.1	81.0	6.8	14.7
Difficult situations 1	0.0	1.9	72.1	60.5	27.8	37.5
Difficult situations 2	0.0	0.0	54.6	61.1	45.3	38.8
Learning logs 1	0.0	0.0	53.1	56.5	46.8	43.4
Learning logs 2	0.0	0.0	72.4	58.8	27.5	41.1
Learning styles 1	6.3	0.0	79.3	86.9	14.3	13.0
Learning styles 2	12.4	6.2	69.2	72.9	18.2	20.7

Note. R1 = 1st researcher; R2 = 2nd researcher

An interesting finding from this method was that social presence was rated as being higher in those activities with less teaching presence ('learning logs' and 'difficult situations'), and those which depended more on student experiences than teacher authority or prior learning. These two types of conversation were more reflective and personal than the 'assessment' and 'learning styles' tasks. However, it is not clear that much useful information about student learning is gained through this approach. The high volume of cognitive presence suggests that all of these OADs were enhancing student learning, but the extent of high-level cognitive activity cannot be gauged from these results.

Method 2: Content analysis based on Bloom's taxonomy

This method appears to have the potential to provide greater insights into student learning since it offers the opportunity to evaluate the level of cognitive engagement of the students involved in the discussion. Bloom's taxonomy can be used to categorise the level of understanding from the lower levels of knowledge and comprehension to the higher levels of analysis, synthesis and evaluation.

Table 6: Percentage of conversation in each category

	1	2	3	4	5	6	7	8	9	10	11	12
	R1 % read	R2 % read	R1 % cont	R2 % cont	R1 % prior	R2 % prior	R1 % real	R2 % real	R1 % abstr	R2 % abstr	R1 % infer	R2 % infer
Assess 1	5.9	0	18.4	6.4	0	0	8.5	40.5	0	10.1	29.7	18.6
Assess 2	0	0	34.3	10.7	0	0	4.1	0	0	6.2	11.8	35
Diff 1	0	0	0	0	0	3.2	53	49.8	0	8	11.2	0
Diff 2	0	0	0	3.2	0	0	63.3	40.1	0	25.3	21.4	17.6
L Logs 1	0	0	21.4	29.5	0	0	36	26.4	0	15.1	34.1	21.8
L Logs 2	0	0	6.3	16.5	0	8.8	21	11.3	0	6.9	19.8	5.8
L Style 1	0	6.2	27.4	11.8	9.7	5.9	21	34.2	4.2	3.6	10.2	18.1
L Style 2	0	3.8	14.9	23.9	8.5	0	23.7	11.9	0	23.4	21.3	12.5

There were some interesting findings from this approach to analysis. For example, both researchers noted the relatively low level of use of 'prior knowledge' (columns 5 and 6) and 'reading citation' (columns 1 and 2) in all conversations, and a relatively high level of 'real world examples' (columns 7 and 8). A relatively high proportion of the discussion was rated as 'making inferences' – the highest order category in this scheme (encompassing analysis, synthesis and evaluation). However, as noted below, there were also significant differences between the categorisations of the two researchers.

Method 3: Quantitative analysis based on intended learning outcomes

This method aimed to isolate not solely cognitive activity, but the proportion of cognitive activity which was focused on the intended learning outcomes for each online activity. Unlike the previous method, no attempt was made to judge the level of student engagement. It is difficult to comment on the findings since the inter-rater reliability was very low. It appears that the learning outcomes were interpreted in a far more stringent manner by the module leader (R1), than by the other researcher (R2).

Table 7: Percentage of conversation related to learning outcomes

	% related to learning outcomes R1	% related to learning outcomes R2	Rank order R1	Rank order R2
Assessment 1	37.3	66.7	5	3
Assessment 2	14.3	50.3	8	7
Difficult Situations 1	51.3	57.8	1	5
Difficult Situations 2	39.5	57.1	4	6
Learning Logs 1	35.2	82.2	6	1
Learning Logs 2	33.4	49.3	7	8
Learning Styles 1	50.9	71.3	2	2
Learning Styles 2	47.7	61.2	3	4

Methodological issues

This study has raised a number of issues in relation to each of these approaches, both generic and specific in nature. Firstly, both researchers felt that the time taken to process these (relatively short) conversations was significant. Method 3 was the quickest to implement (approximately one hour), but clearly this approach also produced significant disagreement. Methods 1 and 2 were more time consuming, taking approximately two to three hours each. Method 2 was judged to be the most involved rating procedure to apply, though in practice the time taken by both researchers for this was similar to that of Method 1. However, this may have been due to prior familiarity with the material, something that would not necessarily be the case if Method 2 was adopted as a sole measure.

Other related issues that arose included the time taken to recognise and deal with incorrect posting of related content in a wrong discussion folder or conversation thread. Aspects that further hinder the application of methods such as these include participants' failure to include a subject line, duplication of subject titles and the varying ability of conferencing software to process and present conversation threads in a coherent manner. It was recognised that private email between individual students may also be present, and this may be making an invisible contribution to the learning outcomes. All of these issues provide a degree of impact on the time taken and the reliability of subsequent analysis.

It became clear that there is a need to measure 'off-topic' and 'organisational' aspects of conversation threads separately in discussion forums. Conversations usually have message headers, signatures and other extraneous information and these 'organisational' aspects should be discounted from measures of word count. They should not, however, be recorded as 'off-topic' conversation since this would suggest a particularly high level of irrelevant talk. Whilst including these aspects in the total word count makes the calculation easier, this produces a 'signal to noise' ratio (in the sense of on and off-topic conversation) that we feel is misleading. Specific issues related to each method are detailed below.

Method 1

Whilst Method 1 appears to produce reasonable inter-rater agreement, a number of issues arose in relation to the overlap between categories. The categories of social and cognitive presence were judged to be

particularly problematic, as a number of postings projected a social presence through comments that were judged to have a strong cognitive element. In this sense, social and cognitive presence may form a continuum, with classification being especially difficult towards the central point.
The concept of 'teaching presence' proved to be similarly problematic, in that a number of postings by tutors were judged to be primarily cognitive in terms of this classification structure. This was exemplified by one particular posting that provided an example of very subtle task direction by a tutor who engaged participants in relatively high level discussion. Had these postings been blind reviewed it is likely that this would have been classified as cognitive presence, teaching presence would not have been considered. It is likely that bias is present here, as there is a natural tendency to look for teaching presence where a discussion thread is known to be posted by a tutor.

It is also acknowledged that certain activities are specifically designed to encourage social presence and the formation of a community of practice and reflective learning logs are good examples of this. It is likely that discipline specific characteristics will emerge here: social presence and reflective practice are often highly valued in teacher development programmes, for example.

Method 2

Both researchers felt that this model produced a deeper focus on activity relating to learning. It did, however, undervalue the discursive aspects of the conversation and social postings were ignored by this approach. In places, the application of this method was difficult to align with the intended learning outcomes – especially where a participant simply expressed agreement with a point of view. In this sense such 'hidden' learning is very difficult to measure.

Again, some overlap of categories became apparent. The separate categories of comprehension and application were neatly spanned by participants' postings that described prior experience (comprehension) in the context of a real world example (application). Should postings such as these be counted in both categories, with the complexities of double counting and the effect on numerical analyses? Should the 'higher level' category take precedence in the analysis?

Method 3

This approach produced the widest variation and least agreement in researcher analysis, apparently due to variation in interpretation of the learning outcomes. One researcher discounted all content that could not be related very closely to the learning outcomes, the other took a broader view and included related content. Both agreed that there were important aspects of discussions that were not explicitly identified using this approach. In particular and in a similar vein to Method 2, this approach does not capture the value of discussion unless it is explicitly cognitive in nature. Moreover, this approach appears excessively narrowly defined in that it excludes any educational benefits of unintended learning outcomes.

Towards a composite method

It is clear from the discussion that all three methods proved to have a number of limitations. Key aspects revolved around the lack of mutually exclusive categories and the degree of focus on the cognitive content. In this respect, Method 2 has particular strengths in terms of the analysis of cognitive content, but uses a larger number of categories which leads to problems with classification. Whilst some interesting findings about student learning were made possible by this study, the problems encountered in implementing each method (in particular the low inter-rater reliability in some parts) give cause for concern. We are therefore proposing to pilot a slightly different method, utilising those aspects of the approaches tested which were most successful.

Although not subjected to statistical analysis, the reliability of the first method appears to be satisfactory. However, the large amount of material categorised as 'cognitive presence' provides little insight into the level and depth of student engagement. The second method (using Bloom's taxonomy) provided more interesting data on student learning but suffered from more substantial reliability problems and discounted all elements of 'social presence'. A composite method, involving selecting the key parts of Bloom's taxonomy and combining them with a measure of social presence, might therefore enable a more meaningful analysis. To this effect we have adopted the revised Taxonomy proposed by Anderson and

Krathwohl (2001) and divided the six levels into two broader subgroups: that of lower level (spanning 'Remembering', 'Understanding' and 'Applying') and that of higher level (spanning 'Analysing', 'Evaluating', and 'Creating').

The categories we propose are therefore:

1. Lower level engagement (Prior learning and experience: Remembering, Understanding, Applying)
2. Higher level engagement (Making inferences and developing new knowledge: Analysing, Evaluating, Creating)
3. Social presence (Indirectly supporting the learning experience)
4. Tutor facilitation
5. Off task discussion

This combined approach will, we hope, provide more detailed measures of cognitive engagement than a collective 'cognitive presence' category, without attempting to resolve this category in overly fine detail. Where postings include an element of social presence and cognitive engagement, we propose to classify the posting as lower or higher level engagement, reserving aspects of postings that are purely social for the category of 'social presence'. Whilst the focus will be on the activities of the learners, tutor postings also need to be quantified (and excluded from total word counts) in order to avoid skewing the results. We also believe it important to quantify the amount of off-task discussion to provide a more accurate measure of 'signal to noise' ratio in this respect.

Concluding remarks

Wider use of these kinds of methodologies provides the potential to enhance e-learning research and evaluation. Benefits include readily available data and the possibility of making comparisons between different types of OAD both within the same course (as in this study) but also between different courses. It would be interesting to note, for example, whether the low level of use of prior knowledge and reading citations were specific to this course, or are a more general feature of online discussions due to their informal nature. In addition, the relatively high level of real-world examples noted in this study may be due to the nature of this course, a practically-orientated and vocational programme of study. Alternatively, this may be indicative of the kind of discourse encouraged by online discussion. These issues are worthy of further study.

References

Anderson, L. W., Krathwohl, D. R. & Bloom, B. S. (2001). *Taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives.* London, Longman.

Bloom, B. S. (1956) *Taxonomy of educational objectives: The classification of educational goals. Handbook 1, cognitive domain*. New York: Longmans, Green.

Davies, J., & Graff, M. (2005). Performance in e-learning: Online participation and student grades. *British Journal of Educational Technology* 36(4), 657-663.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *Internet and Higher Education*, 11(2), 1-14.

Gilbert, P. K., & Dabbagh, N. (2005). How to structure online discussions for meaningful discourse: A case study. *British Journal of Educational Technology*, 36(1), 5-18.

Murphy, E. (2004) Recognising and promoting collaboration in an online asynchronous discussion. *British Journal of Educational Technology*, 35(4), 421-431.

Richardson, J. C., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *Journal of Asynchronous Learning Networks*, 7(1), 68-88.

Volet, S., & Wosnitza, M. (2004). Social affordances and students' engagement in cross-national online learning: An exploratory study. *Journal of Research in International Education* 3, 5-29.

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An experience with conducting a role-play in decision making for a food and nutrition policy course

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In 2005 post-graduate students participated in an online role-play in a distance Masters in Public Health course, *Food and Nutrition Policy Studies*, at the University of New South Wales. A major course outcome is for students to appreciate the political dimensions of policy formulation and to understand that it is not just a matter of researching and analysing relatively objective food and nutrition data. The strategy we chose to achieve this was a two-week online role-play, using a WebCT discussion group, in which students were assigned roles as members of an inter-sectoral national Food Policy Planning Committee. This was embedded in a realistic case study, which forms the backbone of the 14-week course. The online environment offered these distance students a real opportunity to learn about the complexity of policy negotiation. We reflect on the factors that appear to have contributed towards the success of this strategy.

Keywords: online, role-play, WebCT, policy

Introduction

Food and Nutrition Policy Studies is a fully distance course in the Masters in Public Health (MPH) at the University of New South Wales (UNSW). In brief, the course introduces students to a staged model of food and nutrition policy development. The model comes alive for them when they use it to analyse the food and nutrition situation in a hypothetical community (the 'Pacifica' case study). Having practised the steps of the model with the case study, their assessment task is to apply the same model in developing a food and nutrition policy for a real community that they have selected themselves.

An important outcome of the course is exploring the complex negotiations that arise as players with different sectional interests engage in the process of policy development. Previously we had required students to video- or audio-record an oral defence of their written policy, as if they were presenting it to a meeting of the stakeholders. While this approach was effective for students who were involved in the area of food and nutrition interventions, it was much less effective and a source of angst for others with no background in the area.

With the introduction of WebCT, it was possible to make the course more interactive. Previously it was only available in paper-based format, supported by electronic interactions for administrative purposes. In 2005, students were offered the opportunity to participate in an on-line role-play of policy development, as an alternative to the oral defence assignment. We reasoned that participation in the actual negotiations would give the students an appreciation of the complexity of the politics of food and nutrition. We evaluated their experience by monitoring online interactions and from students' written reflections on how participation in the role-play contributed to their learning.

Development of the role-play

Use of existing resources

The idea for the online role-play arose from the case study around which the course is structured, which contains a detailed description of a hypothetical country, 'Pacifica.' Based on the authors' work-experience in the Pacific, the case study contains realistic demographic data and descriptions, and includes information on stakeholders and their perspectives. We had not envisaged using a role-play when we first wrote the case study, as the students were very widely dispersed and the course is fully distance, but when WebCT provided the opportunity for online interactions, Pacifica provided a good basis for students to make an easy transition from merely reading about stakeholder perspectives to acting them out in the role-play.

Role-play outline

Five students volunteered to participate. Each was assigned to represent a different sectional interest on the Pacifica Food and Nutrition Policy Planning Committee. The ‘Planning Committee’ had two main tasks. They were to participate in a series of Committee meetings in which they were to (a) prioritise six food-related health outcomes and then (b) propose strategies to achieve the top priority outcome. The health outcomes were provided to the Committee prior to the role-play commencing.

Instructions were clear and specific. Pacifica set the context of the task and the Departmental/Sectional perspective of each Committee member. This information was available to all players. We also supplied brief character notes by private email for each role, which included personal perspectives, alliances or antagonisms, and other relevant information. In this way each role had a clearly defined public and private persona but retained a certain amount of liberty for improvisation in the subsequent interactions.

There were few role-play rules except that the interactions should simulate a formal face-to-face meeting. Each Committee member had to contribute to the discussions and respond to other people’s contributions. They were free to agree or disagree with each other but always had to justify their point of view. One member was designated to chair the meetings.

Two weeks were allocated for the Committee to complete the tasks. Participants then disengaged from their roles and wrote a reflection on their own learning during the exercise.

Use of WebCT

We set up a WebCT discussion group with access limited to the role-play participants. We chose asynchronous discussion, even though it is a less realistic simulation of a meeting than the WebCT chat or voice options, because the students were dispersed across several time zones. We also sought well-considered responses, which are less likely with real-time interactions.

The moderator posted general instructions for conducting the role-play, and invited the Chair to open the meeting. During the role-play the moderator acted mainly as facilitator and not as a stakeholder or Committee member. Interventions were primarily to encourage contributions from participants early in the role-play, and no contributions were made to the substance of the discussions.

Contributions were initially slower than we anticipated. On reflection, we believe that participants required extra time to re-read the Pacifica notes and to prepare themselves for their roles. It took the full two weeks to achieve the two tasks. Participants (more or less) maintained their roles for the duration. The pattern of contributions suggested two main peaks of activity relating to the main tasks. Participants responded to each others’ comments, and their contributions provided evidence that they were acting in their publicly-stated Departmental/Sectional position, with some aspects of their private allegiances. There was also evidence of some improvisation.

Debriefing and reflecting on the learning process

Participants were supplied with guidelines to assist them to reflect individually on the successes and failures of the group in getting the tasks completed. Their responses suggest that the role-play had been a valuable learning experience.

A number of the reflections related to an understanding of the political process:

> 'People often complain how slow government works but now I have a better idea of why'
> 'It is difficult to get different people from different groups to agree. Many compromises must be made'
> 'Collaboration between different divisions is easy to state but (it is) difficult to obtain an agreement that suits all'
> 'People also own the policy if they have been involved in the development of it'

Other reflections articulated more personal thoughts on their learning from the process:

> 'I now realise how hard it is to make policies, especially one everyone will be happy with'
> 'People usually have a reason for taking a position' 'I toed my line first, but then I compromised to an extent'
> 'Sometimes I even found the process frustrating when no decisions were made'

There were few reflective comments about the role-play as a learning medium or about the on-line process. One participant found that

> 'being online made it harder than it would have had it been in person. You can't ask questions at the time and expand if necessary. You also have to wait for people to reply to questions posed online.'

We did not specifically ask them to reflect on these aspects; rather we asked them to reflect on what they had learned about the process of policy food and nutrition policy development.

Discussion

Role-play is not a new teaching method. When the issues considered are realistic, role-play enables students to have a more authentic experience of the constraints and pressures than would be possible using more conventional teaching strategies (van Ments, 1994). In face-to-face classes some students find the acting required of them detracts from the value of the learning experience. On-line role-play does not require acting, offers anonymity and allows more time to concentrate on constructing considered responses (Spears, 2002).

Participants were informed at the beginning that the moderator would take a minor role in the process, primarily as facilitator and observer but that she would intervene if circumstances warranted it. They were also informed that they could request additional information if they thought it necessary, but none did. The facilitator did intervene successfully on several occasions to encourage slow responders to contribute.

Hedberg (2002) considers role-play to be an effective strategy when the learning task is to explore the perspectives and issues surrounding a process. The elements that contribute to a successful role-play are: realism, participants having researched the topic, roles in which some characteristics are public and some are known only to the player and the moderator, a specified length (ideally about two weeks), a clear outcome, participant anonymity, and following the role-play, a process of participant reflection on the group's success or failure to complete the task.

We evaluated our role-play against Hedberg's elements. With regard to realism, the Policy Committee meeting modeled a formal work meeting surprisingly well and provided a reasonably authentic experience of the difficulty of policy negotiation. This was, after all, the point of the exercise. We acknowledge that a real time chat might have been more realistic but working across different time zones made it impractical. From our perspective, as course designers, the role-play was more effective than previous strategies in helping students to understand policy development.

In terms of knowledge of the topic, all students were working from the same knowledge base, the Pacifica case study. They did not explicitly contract with the moderator, as Hedberg suggests, in order to define their characters. The public persona was defined by the case study and known to everyone; some additional aspects of the private persona were provided by the moderator. Within these boundaries, participants, as postgraduate students, were considered to be adult learners and given a certain degree of freedom as to how they chose to develop their character. We feel that the flexibility of this approach allowed for character development as the role-play proceeded and added realism. For the most part, participants remained faithful to the role and it was not necessary for the moderator to intervene.

Hedberg (2002) suggested that a simple role-play should have one week preparation, one for the actual interaction and one for debriefing and reflection. We allowed two weeks, and this appears to have been just sufficient for preparation and interaction; although more time may be needed to accommodate students from different time zones. We did not allow sufficient time for reflection. van Ments (1994) has stated that the debriefing session is the most essential component of conducting a role-play. The session enables reflection on both the process and product; it allows meaning to be clarified and reinforces the lessons learned. Participants wrote individual reflections, but a group reflective discussion on the experience would have been beneficial for the participants and for us. Next time, we will pay more attention to the three perspectives identified by Ip et al. (2002), i.e., students' own perspective revealed through reflection, the role/character perspective, and the perspective of an observer in which the process itself is analysed. The importance of the debriefing process is illustrated by a comparable number of contributions posted during the debriefing as during the role-play itself (Barron, 2003).

Our role-play required a clear outcome. This was well understood and valued by the participants as it was assessed. The tasks assigned to the Committee were concrete and deceptively small and simple. Our estimate that two tasks would be sufficient turned out to be realistic. If this had turned out not to be the case, it would have been easy to set additional, clearly defined tasks.

Ideally participants in a role-play refer to each other by their character names, and Hedberg suggests a strategy to maintain the anonymity of participants by using the role name to sign on. We chose not to do this, as it would have meant going outside WebCT. In WebCT each contribution appeared with the students' real name as there is no option to assign an alias. We circumvented this problem by getting students to use their role title as the subject. Although this was not an ideal solution, participants did not mention lack of anonymity as a constraint.

This role-play was particularly well suited to achieving the course outcome. It appears to have provided an appropriate simulation of the kind of issues that face decision makers in developing a food and nutrition policy. In future courses, we intend to have several concurrent "Committees", and it is likely that some of these will select different priorities and strategies. Such a situation could open up the opportunity to deepen learning through participation in a final discussion across the groups about the process that led each to different conclusions.

Conclusion

This first run of an on-line role-play appears to have been successful for a number of reasons. The course already had a detailed case study that leant itself to further development, so it was a reasonably small step for the designers to create the role-play and for students to identify with the roles. The role-play was an appropriate strategy for achieving an important course outcome, which was to explore perspectives and issues surrounding a process. The role-play was assessed, and so it was valued by the students. It was within students' and moderator's technical capability, because it used WebCT, with which UNSW staff and students are now familiar.

References

Barron, M. (2003) An Online Role-Play – from Design to Debrief. *The Knowledge Tree. An e-Journal of Flexible Learning in VET*. Edition 3, August 2003. http://knowledgetree.flexiblelearning.net.au/edition03/html/pra_barron.html [viewed 20 July, 2006].

Hedberg, J. (2002) *Online Role-Play: Quickstart Role-Play #1*. Learning Designs Web site: http://www.learningdesigns.uow.edu.au/guides/info/G1/index.htm [viewed 20 July, 2006]

Ip, A, Linser, R, Jasinski M. (2002) *The Zen Of Being An Effective 'Mod' In Online Role-Play Simulations*. ©2002. Southern Cross University. Retrieved 20 July, 2006 from http://ausweb.scu.edu.au/aw02/papers/refereed/ip/paper.html [viewed 20 July, 2006]

Spears M.(2002) Online Role-play – a beginner's perspective. http://designing.flexiblelearning.net.au/extras/marie/margaret_spears/margaret_spears_1.html [viewed 20 July, 2006] van Ments, M. (1994). *The effective use of role-play*. London: Kogan Page Ltd.

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Who's learning and how? Researching the learner experience

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This paper provides an overview of the recently completed Learner Experience of E-learning (LEX) research study which was funded by the Joint Information Systems Committee (JISC) in the UK. By interviewing learners from a range of post-16 educational contexts from across the country, the study aimed to elicit their views, not only on technology enhanced learning, but also on how they use technology in their everyday lives, and the impact this may have on their attitudes and approaches to learning. The paper will explain the rationale behind the research, describe the development of an innovative research methodology and outline the main findings as illustrated in the final project report. The findings indicate that there are several under-researched aspects of e-learning which would merit further investigation including the ubiquitous use of social software, learner control issues and the emotional impact of technology use. The paper concludes that tutors, course designers and managers would benefit greatly from taking time to listen to their learners.

Keywords: learner experience, learner voices, research approaches, technology in life and learning

Introduction

Who are our learners, how do they learn, and what kind of technology are they using? These are just a few of the questions which the Learner Experience of E-learning (LEX) study set out to investigate. Most e-learning research to date has focused on specific aspects of technology enhanced learning with use of particular types of software and hardware such as virtual learning environments, discussion boards and, more recently, mobile devices (e.g. Browne & Jenkins, 2003; Sorensen & Takle, 2002; Attewell, 2005) Case studies of discipline-specific courses are also prevalent with useful examples of good practice in e-learning (e.g. Atak & Rankin, 2002; Dickey, 2004) which practitioners can adapt and emulate in their own context. Overall the emphasis is very much on the practitioner's perspective however, and in only a few cases do we hear the learner's own story (c.f. Jones et al., 2001; Timmis et al., 2004). A Scoping Study funded by JISC in 2005 to inform and shape its research strategy in this field also revealed that the majority of studies have taken place in the higher education (HE) sector and that learners from further education (FE) and adult and community learning (ACL) contexts are poorly represented (Sharpe et al., 2005). The LEX study therefore set out to help redress the balance.

Background

The LEX research study was supported by the UK's Joint Information Systems Committee (JISC) as part of the 'Understanding My Learning' theme under its Pedagogy research strand, and ran for one year from May 2005 to June 2006. LEX had the broad and wide-ranging aim of researching learners' current experiences and expectations of e-learning across the post-16 sectors of further, higher, adult, community and work-based learning. The final report on which this paper is based was completed in August 2006 and is available to download from the JISC web site (Creanor et al., 2006b).

Informed by the recommendations of the Learner Experience Scoping Study described above, we sought to find answers to three key questions:

- What might characterise effective learners in an e-learning context?
- What beliefs and intentions do effective learners display?
- What strategies and behaviours do effective learners display?

The paper will outline the approach to the research methodology and data analysis which the team adopted and provide an overview of some of the key themes which emerged from the study. It will briefly highlight the implications these raise for teachers, course designers and institutional management. Primarily however, it will focus on the learners' voices.

Research methodology

In order to elicit the wide-ranging and highly personal views which the study required, we adopted a phenomenological approach (Marton, 1994). The data collection was conducted primarily through face-to-face interviews with learners, supplemented by a few focus group sessions, initially to assist with the identification of suitable interviewees and latterly to cross-validate emerging themes. As the study focused on the very broad area of technology use for learning, we were keen to explore also how learners used technology in everyday life and how this in turn might impact on their learning. Following much useful debate and discussion with colleagues, we decided to adopt an interpretative phenomenological approach to encourage openness and informality during the interviews.

Interpretative phenomenological analysis, or IPA, has to date been used mainly in health and psychology disciplines (Reid et al., 2005). It relies on a very open approach to interview, and on the assumption that the interviewee is expert on their own experience. It does not seek to test assumptions, but rather depends on the emergence of themes as the interview progresses. The interpretative nature occurs as the interviewee seeks to describe and make sense of their lived experience for themselves and then for the interviewer, whose role is to encourage reflection and self-awareness.

To supplement IPA we also employed Interview Plus, an approach recommended by the JISC Scoping Study team and Pedagogy Strand consultant. Interview Plus involves the introduction of a learning artefact which has been produced or used by the participant in their learning, to provide a focus for discussion at an appropriate stage in the interview. Examples might include digital resources, a discussion board, blog or e-portfolio. To avoid too narrow a focus at the start of an interview however, we found it helpful to introduce these artefacts towards the end of the discussion when they often served to remind the interviewee of aspects of their learning which they may not have mentioned previously (see Creanor et al., 2006a). A fuller description of the innovative LEX methodology can be found in a separate report which is also available to download from the project web site (Mayes, 2006).

Sampling strategy

The analytical nature of IPA methodology restricts the numbers of participants to a manageable number within the timescale available, with most research to date reporting on small studies with little more than a handful of participants in a particular context as described by Reid et al. (2005). As the LEX study encompassed a range of educational settings however, it was necessary to extend this limited approach to include a representative sample from HE, FE and ACL settings. Working with colleagues and with contacts from our own personal networks, we quickly identified a range of interesting courses from across the UK where learners were being asked to engage with e-learning in different ways. A total of 55 participants took part in the 22 interviews and 6 focus groups, comprising 24 males (43.7%) and 30 females (54.6%). One person did not state their gender. These participants represented a range of backgrounds including:

- Higher Education (HE): undergraduate Business Studies, Economics and Marketing programmes; postgraduate Law diploma
- Further Education (FE): Higher National courses in Social Care, Customer Care and Hospitality
- Adult and Community Learning (ACL): Trade Union course for union representatives; adult numeracy, literacy and English language (ESOL) courses.

Reflecting the changing profile of today's learners, they ranged in age from 16 to over 65, of whom 30 were aged 25 or over. The majority (71%) were also in employment, with 18 working full time and 21 part-time. A further 5 were actively seeking employment.

Learner voices

The complexity of the learning context is already well documented (e.g. Entwistle et al., 2002; Mason & Weller, 2000) but becomes more vivid as learners describe the complicated nature of their lives, the ubiquitous nature of technology use and the many external influencing factors over which tutors have no control. Accessing these very personal perspectives presents many challenges, not least of which is finding a common language. In this, we allowed the interviewees to take the lead. Only a small minority used the term 'e-learning', mainly because it had been introduced to them as such by their tutors. For most it was simply another method to help them learn.

> To me it's just learning, the fact that it's online as opposed to in a classroom is irrelevant. It's just another way of accessing it. It's all just learning... it strikes me as quite old fashioned and quite quaint, but talking to other people they're like 'oh wow! It's online! Its e-learning!' and I think it depends on where you're coming from what it means to you, but for me I just think of it as learning and I don't use the term. (Rebecca, adult online learner)

Defining 'effective' learners was always going to be problematic, and again we made a deliberate decision to allow characteristics to emerge rather than impose any preconceived, tutor-influenced preconceptions of what this might mean. As the learners reflected on, interpreted and re-interpreted their experiences, both positive and negative, the underlying themes gradually surfaced. The evidence gathered validates a few of the issues which are already familiar in the research literature, but other, less well-researched aspects have also come to the fore. The following sections provide an overview of some of these themes.

How do we characterise effective learners in an e-learning context?

Perhaps unsurprisingly, our findings show that technology rates as a relatively minor factor in the profiles of those who might describe themselves as effective learners. Characteristics such as confidence in their ability to cope with life, learning and technology; the capacity to network with others through a variety of communication channels; highly effective time management skills; and, most crucially, the skill to integrate and balance learning with work, leisure and family commitments are key. Boundaries between these different aspects of their lives were often blurred, and learning was seen as being very much part of their identity.

> And it is very, it's quite difficult, you know [learning], that's, that's the whole point really isn't it. It's a bit of a challenge to yourself, you know. (Vanessa, FE languages student)

> But something like this [the internet] I guess it expands all your horizons in completely different ways and helps you to apply academic stuff to everyday life and see where current affairs and things fit into the academic. (Emma, undergraduate business student)

A high level of IT skills was not necessarily seen as a pre-requisite for being an effective e-learner, nor was the type of technology used within a course (e.g. Moore & Aspen, 2004). There was also recognition however that the skill set required for e-learning differed from generic IT competencies. What appeared to be more important overall was a willingness to learn.

> I'm beginning to rely less and less on other people showing me what to do. Instead of being afraid of technology on the computer, I'm beginning to learn, well, it's not as bad as it seems, take your time, if you make a mistake it doesn't matter, just do it again. (Michele, adult learner on trade union online course)

> I thought it would be OK because I'm so used to doing word processing ... and I'm really fast at typing and things so that wouldn't pose a problem for me at all. What I didn't realise was that I would need to go into the internet and so I was feeling quite confident but now I don't feel as confident about that. (Focus group member, FE social care day release course)

The influence of technology on informal learning also emerged strongly for these learners, e.g.

> I do think I learn outside the university through the internet because you can get websites now, Wikipedia, the online encyclopaedia, I've been on that recently and just so many facts I've picked up from that, just me being bored looking at things. (Laura, first year undergraduate student)

Confirming studies by Oblinger (2003) and Veen (2005), effective learners described themselves as highly skilled networkers, often using the technology to access support when needed.

> Using, like, computers for your assignments and even mobile phones …, getting with your friends or even tutors, mobile phones have started coming in a lot….Just by using text messages maybe and saying, 'Do you know how to do this bit?' (Richard, FE Hospitality student)

There was also evidence to confirm that more mature learners felt that younger people had an advantage when it came to using technology,

> ... the kids know everything there is to know about new technology, you know, so if you've got a young person around then they would be able to show you everything there is to know about it. (Focus group, FE Social Care students)

with the younger learners essentially confirming this view.

> ...you just, you take it for granted because, well, our generation has sort of grown up with it so ... we just take it all for granted that, oh well, that's always been there and we'll just use it. (Lynsey, first year Economics student)

Effective e-learners therefore are flexible, resourceful, self-aware, and highly motivated. They generally remain unphased when aspects of learning and/or technology do not proceed quite as expected as they have strong support networks and are adept at knowing when and how to use them.

What are the beliefs and intentions of effective e-learners?

Not all interviewees were entirely convinced of the benefits of e-learning, and several noted that they expected technology to be employed in a way that would be beneficial for their learning, rather than simply for the sake of convenience,

> I don't really like to, just sort of go headlong into using something new because I always like to see what it is that, you know, what the new technology's going to do for me... (Amanda, postgraduate law student)

Many strongly believed that technology could support and enhance their learning, and in many cases was an essential part of their lives,

> I'm addicted, it's the first thing I turn on in the morning before I even wake up and it actually it's very, very bad. I think in the future people can't cope without their laptops. My main use of it is I guess social networking. It would be My Space and Messenger and e-mail things like that and then secondary would be information gathering in terms of, like I said, my home page is the technology website and current affairs, news. I have alerts coming into me so I get information and then I use search engines for academic purposes. (Emma, undergraduate Business student)

> Because I have a hearing impairment sometimes I don't find classroom environments easy to work in and I have other health issues … if I'm ill and I can't go to a class then I've missed that lesson and I'm relying on somebody else giving me that information, whereas if I'm doing it online I can just go in tomorrow and I'm ok and I can catch up. (Jenny, adult online learner)

One recurrent theme was the learners' strong emotional response to technology and to e-learning, including frustration, gratitude, fear and even love (c.f. O'Reagan, 2003).

> I use my laptop, I take it away, it's attached to me, I couldn't survive without it. (Emma, undergraduate business student)

> Yeah well, basically, when I first went on and started to look at it I thought 'Oh my God, I don't know whether this [online learning] is for me?!', but then I thought, ' Calm down a bit and sit down and go through it step by step.' (Michele, adult online learner on trade union course)

Several interviewees preferred to separate technology use into study and leisure activities, particularly when it came to their personal gadgets such as mobile phones and MP3 players, while others managed to combine them successfully.

> I try and only do fun stuff at home and I don't really know if I would want to have an iPod with like [learning] stuff on it because then if you're not doing work you feel guilty, but if you are doing work the temptation's there to listen to more interesting things. I think it's quite good just to separate them. (Nicola, postgraduate law student)

> I use my phone because it's like a mobile internet to me because they can talk to me, they can SMS me, unlike the email, I need to go on the computer and open my mail box, but with the mobile phone I can get any communication any time I want. That's the technology I use. (Dumisani, undergraduate marketing student)

There was also substantial evidence that the use of technology had an impact on learners' confidence and self-esteem.

> I am, yes, very much, so [confident], you know, and even at work, you know, I've been able to help people out, you know, maybe people that have problems or whatever and I've been able … to show them how to do different [things]. (Anne, FE Estates Management student)

In many cases, tutor influence and human intervention were highlighted as key factors, and learners were very aware when tutors were not fully engaged, or if the e-learning was not well integrated with face-to-face activities.

> I think it depends on the teacher really….if they're on board with it a hundred and ten percent then you'll be included. If they're not then they won't use it and neither will you. (Vanessa, HND languages student)

Beliefs, attitudes and intentions are as varied as the participants, and the themes highlighted here represent only a proportion of those which emerged. Nevertheless, they tell us that effective e-learners are generally positive about technology and are willing to engage with it, even when they do have some initial reservations. They have clear expectations on tutor involvement, hold strong views on how and why technology should be used, and most importantly, display very understandable emotional reactions to the technology and the way they are expected to engage with it.

What strategies and behaviours do effective e-learners adopt?

As is already evident from the literature (e.g. Allan, 2004; Sweeney et al., 2004; Moore & Aspen, 2004), the flexible nature of e-learning is generally welcomed by learners. We found that this was particularly important for adult learners who reported making full use of the technology to help them organise their study around other aspects of their lives.

> I can do them [the online activities] anytime, anywhere. At home, at work. When I've got 10 minutes in between meetings, half an hour between other things, its just you can slot it in any day of the week, you don't have to take a whole chunk out of your day to attend a course. (Rebecca, adult work-based online learner)

> I think that's very helpful, we get to work through that at our own pace and it's all on the web page at the college. It's good that everything's on there so I can access it from home, I can access it from work, I can access it in here [the college] and [the VLE] tends to be quite well laid out and quite user-friendly. (Joe, day-release Social Care student)

Approaches to study were varied, but for many learners, the complex nature of their lives was reflected in how they used technology to study, communicate with peers, family and friends, and engage in leisure activities, often all at the same time. This is very different from the traditional quiet study mode which tends to be supported within institutions.

> I was writing my ... project, I was doing my blog and doing my homework for economics all at the same time and the funny thing was, I mean I was sitting there and ... listening to music in the background and having a laugh to myself thinking who says men can't multitask! (Paul, mature undergraduate student)

Many reported being very aware of the distractions offered by technology, but still found them hard to avoid.

> I find it a bit difficult using the internet all the time because I find that you get waylaid and other things pop up and ... I find I'm distracted, very distracted, you know, that I find that you just can't access the exact thing you're looking for and I spend so much time trawling, surfing the net looking for the information that I'm looking for, you know, the specific stuff that I need. (Focus group, FE students)

There were many instances where family relationships were reported as important aspects of learning.

> [e-learning] is actually helping me with my kids as well because as my eldest son, like I said, he wants to do games design, here. But now we can discuss things and look at things together… but him and I can discuss things now without it going right over my head. (Paul, mature undergraduate economics student)

> …my Mum did a course in Microsoft Word and Excel, like, at college, and she taught me how to use, like, all the detailed versions, then when I was at school I learned bits and that but my mum was the main teacher to me of the processes. (Alan, final year undergraduate student)

Although home circumstances sometimes had a detrimental effect on access to technology.

> The only bad thing I've got is, if I'm sitting on the computer, guaranteed the kids want on it and then they're like, 'oh can I get on, can I get on', so in the end I just get up and leave it and let them go on it. (Focus group member, FE students)

Student perceptions of online discussions are well represented in the literature (e.g. Sweeney et al., 2004; Rourke & Anderson, 2002; Salmon, 2002), and are often key features of the e-learning experience. The interviewees reported mixed views on these as well as other types of learning activities such as online group work, e-portfolios, video lectures and assessment.

Online group work:

> It's dependant on other people or the rest of the class catching up on some of the activities, you can't do without everybody else for instance. I find that slightly irritating because why I go online is that you should be able to go at your own pace but it doesn't always work out like that, depending on how the course is set up. (Rebecca, adult work-based online learner)

Video lectures:

> … I find my concentration's not so good, do you know what I mean, because you know, you're sitting there on your own [watching a video lecture] and you're sort of looking at the

> time and thinking, 'Oh well I really want a cup of tea' and thinking 'Well, I'd better watch this' Obviously if you're in a lecture theatre, you know, you have to be there for an hour and that's it finished…. (Amanda, postgraduate student)

Assessment:

> [E-learning] doesn't help you in your exam periods because it's not a traditional form of assessment so if you're teaching over the internet you should also include, like, literature skills you need for exams. It's harsh for [the tutor] to say you've got to do this piece of course work on the internet and use the internet and type it up and use these specialist programmes, but then your exam's something you've got to write about ... so I think that's a disadvantage. (Alan, final year undergraduate student)

Learners often reported taking control of their learning by making choices on how, when and where they learned. This often subversive behaviour was reported as being mostly invisible to tutors.

> So my [group] we always text each other and say, 'oh are you coming in at this time' or 'we'll meet at this time', and so it looks on the face of it from the university website that we haven't been communicating all year but we have, it's just outside of that [discussion] board. (Nicola, postgraduate law student)

Cost effectiveness was also a key factor for many, particularly in comparing books and the internet, but this was also tempered by a realisation that online information may be less reliable.

> ...when doing research its torture if it's a bad website and sometimes I'm finding, on essays and things, you've got to add lots of references … and they're saying use books, but books cost money so the internet is the main thing that we end up using and just trawling through all these websites, you never know if the knowledge is actually good or not, so I'm always worried that I'm handing something in which is completely just one guy's opinion, but it looks really professional, but maybe he's a complete liar but he's made a really pretty web page [laugh]. (Laura, first year undergraduate economics student)

Based on the evidence gathered here, effective learners have strong views on how and why technology is used for their learning, and are prepared to adapt activities, environments and technologies to suit their own circumstances. They have a very sophisticated awareness of their own preferred approaches and those of others. The influence and support of family and friends play a major role, and control and choice are key factors.

Towards a conceptual framework of the learner experience

In order to make sense of the rich data collected and to provide a higher level framework within which the learner experience might be situated, we settled on two key learner questions:

- What factors influence what I do with my learning?
- What factors influence how I feel about my learning?

This led to the creation of a series of five, high level categories relating to life, formal learning, technology, people and time, within which a further five dimensions encompassing the main influencing factors are situated, i.e. control, identity, feelings, relationships and abilities. In keeping with the ethos of the study, each of these is evidenced by the learners' own words. A short extract from this, highlighting the technology category only, is reproduced in Table 1 below. A more complete version along with an accompanying concept map is available on the project web site (Creanor et al., 2006b).

Table 1: Towards a conceptual framework

	Control	Identity	Feelings	Relationships	Abilities
Technology	It's the same way with learning to use computers and software packages… It tends to be very hands-on and people like to just touch it and feel it and experience it and it's like a friend of mine bought a new phone last week and she spent the entire day she got the phone just exploring it, do you know, working out how everything works and what way you want it to work for you. It's very much an interactive touchy-feely thing.	I'm beginning to rely less and less on other people showing me what to do, instead of being afraid of technology on the computer, I'm beginning to learn well its not as bad as it seems, take your time, if you make a mistake it doesn't matter just do it again.	Because to me a … design is a creation like a painting or you know, drawing and if I did it on the computer it would sort of lose, I think it would look too clinical.	…so my [group] we always text each other and say oh are you coming in at this time or we'll meet at this time and so it looks on the face of it from the university website that we haven't been communicating all year but we have, it's just outside of that board…	You get a wee boost the first time you do something, you get a 'oh right, I've done that myself' and then you get that wee confidence boost and you'll go to the next step, you know. The first time you kind of hit a brick wall you kind of, you know, I did it too and you go 'aargh' but when you do it the first time you think 'I done that' and then move onto the next thing, it's definitely worth it.

Conclusions and recommendations

The LEX project has broken new ground through the exclusive focus on the learner voice across the post-16 sector, and in the development of a robust methodology for interviewing, recoding and analysis. The learners we spoke to were ready and willing to talk about their experiences of learning, technology and life and our findings show that any initial hesitation can be overcome if a suitable approach is used. They have provided us with a huge amount of extremely rich data that will take some time to fully analyse. What we have presented here gives a flavour of their views, from which tutors, course designers and institutions have much to learn. For example:

- How ready are we to capitalise on the ubiquitous use of technology in our learners' lives?
- How will institutions cope with the increasingly pervasive nature of social software and mobile devices which learners choose to use, often overriding tutor guidance and institutional support structures?
- How will we adapt the design of e-learning to encompass, rather than exclude, the technologies and approaches our learners are comfortable with and choose to use?
- How can we prepare staff for these new approaches in an evolving learning landscape?

Although some of the themes which emerged are already familiar, others warrant further investigation. These include, for example:

- the 'underworld' of digital communication among learners
- building on the increasing prevalence of informal learning through technology
- the extent of learner choice and control over technology, learning activities, and the learning environment
- emotional aspects of technology enhanced learning and its impact on confidence, self-esteem and motivation to learn

As a research team, we feel privileged to have been allowed access to the very personal reflections and experiences of the learners, and would commend the LEX approach as a valuable one in eliciting thoughts, feelings and attitudes which are unlikely to emerge through large scale surveys, questionnaires or even semi-structured interview techniques. In conclusion, we would recommend that all those involved in teaching, developing, supporting and promoting technology enhanced learning should regularly take time to pause, listen and learn directly from the learners.

References

Allan, B. (2004). E-learners' experiences of time. In *Proceedings of Networked Learning Conference*, (pp. 341–347). Lancaster.

Atack, L. and Rankin, J. (2002). A descriptive study of registered nurses' experiences with web-based learning. *Journal of Advanced Nursing*, 40(4), 457–465.

Attewell, J. (2005). *Mobile technologies and learning: a technology update and m-learning project summary*, Learning & Skills Development Agency. http://www.m-learning.org/docs/The%20m-learning%20project%20-%20technology%20update%20and%20project%20summary.pdf [viewed October 2006].

Browne, T. and Jenkins, M. (2003). *VLE Surveys: a longitudinal perspective between March 2001 and March 2003 for Higher Education in the UK.* UCISA. https://www.ucisa.ac.uk/groups/tlig/vle/vle2003.pdf [viewed 18 October 2006].

Creanor, L., Gowan, D., Howells, C. and Trinder, K. (2006a). The Learner's Voice: a focus on the e-learner experience. In *Proceedings of Networked Learning Conference*. Lancaster. http://www.networkedlearningconference.org.uk/abstracts/creanor.htm [viewed 23 July 2006].

Creanor, L., Gowan, D., Howells, C. and Trinder, K. (2006b). The Learner Experience of E-Learning (LEX) Final Report. http://www.jisc.ac.uk/whatwedo/programmes/elearning_pedagogy/elp_learneroutcomes.aspx [viewed 18 October 2006].

Dickey, M. D. (2004). The impact of web-logs (blogs) on student perceptions of isolation and alienation in a web-based distance-learning environment. *Open Learning*, 19(3), 279–291.

Entwistle, N., McCune, V. and Hounsell, J. (2002). Approaches to Studying and Perceptions of University Teaching-Learning Environments: Concepts, Measures and Preliminary Findings. ETL Project, Universities of Edinburgh, Coventry and Durham. *Enhancing Teaching and Learning Environments in Undergraduate Courses Occasional Report 1*, September 2002. http://www.ed.ac.uk/etl/docs/ETLreport1.pdf [viewed 21 July 2006].

Jones, C., Asensio, M., Goodyear, P., Hodgson, V. and Steeple, C. (2001). *Networked Learning in Higher Education Project: Final Report on the Field Studies*, University of Lancaster. http://www.lancs.ac.uk/users/edres/research/csalt/networklearn/ [viewed 21 July 2006].

Marton, F. (1994). Phenomenography. In T. Husen and T. N. Postlethwaite (Eds.), *The International Encyclopedia of Education 2nd Edition*. Oxford: Pergamon.

Mason, R. and Weller, M. (2000). Factors affecting student satisfaction on a web course. Education at a distance. *Australian Journal of Educational Technology*, 16(2), 173–200. Retrieved on 3rd June 2005 from the World Wide Web: http://cleo.murdoch.edu.au/ajet/ajet16/mason.html.

Mayes, J.T. (2006). The Learner Experience of E-Learning (LEX) Methodology Report. http://www.jisc.ac.uk/whatwedo/programmes/elearning_pedagogy/elp_learneroutcomes.aspx [viewed October 2006].

Moore, K. and Aspen, L. (2004). Coping, adapting, evolving: the student experience of e-learning. *Library and Information Update,* Sheffield Hallam University. http://www.cilip.org.uk/publications/updatemagazine/archive/archive2004/april/update0404a.htm.

Oblinger, D. (2003). Boomers, Gen-Xers & Millenials: Understanding the New Students. *Educause Review*, July/August, pp37–47. www.educause.edu/ir/library/pdf/ERM0342.pdf [viewed 23 July 2006].

O'Reagan, K. (2003). Emotion and e-learning. *Journal of Asynchronous Learning Networks,* 7(3), 78–92.

Reid, K., Flowers, P. and Larkin, M. (2005). Exploring Lived Experience. *The Psychologist*, 18(1), 20–23.

Rourke, L. and Anderson, T. (2002). Exploring social interaction in computer conferencing. *Journal of Interactive Learning Research*, 13(3), 257–273.

Salmon, G. (2002). *E-tivities: the key to active online learning.* London: Kogan Page.

Sharpe, R., Benfield, G., Lessner, E. and DeCicco, E. (2005). *Scoping Study for the Pedagogy strand of the JISC e-Learning Programme.* http://www.jisc.ac.uk/uploaded_documents/scoping%20study%20final%20report%20v4.1.doc [viewed 21 July 2006].

Sorensen, E.K. and Takle, E.S. (2002). Collaborative Knowledge Building in Web-Based learning: Assessing the Quality of Dialogue. *The International Journal on E-Learning*, 1(1), 28–32.

Sweeney, J., O'Donoghue, T. and Whitehead, C. (2004). Traditional face-to-face and web-based tutorials: a study of university students' perspectives on the roles of tutorial participants. *Teaching in Higher Education,* 9(3), 311–323.

Timmis, S., O'Leary, R., Cai, C., Harrison, C., Weedon, E., Trapp, A., Alexander, S., Jacobs, N., Cook, J. (2004). *SOLE project: Thematic Report on Student and Tutor Roles and Relationships,* University of Bristol. http://sole.ilrt.bris.ac.uk/findings.html [viewed 21 July 2006].

Veen, W. (2005). 2020 Vision: Wim Veen's Projection, Online Educa Berlin. http://www.global-learning.de/g-learn/downloads/veen_visions2020.pdf [viewed 23 July 2006].

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Using fMRI to explore interactivity and cognition: A methodological case study

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Recent educational models of computer-based interactivity stress the important role of a learner's cognition. It has been suggested that interactive learning tasks carried out in the context of an authentic, problem-based scenario will result in deeper, elaborative cognitive processing leading to greater conceptual understanding of the material presented. Research methods that have been used to investigate cognition and learning have traditionally included self-report questionnaires, focus groups, interviews and think-aloud protocols and, more recently in computer-based settings, interaction log file or 'audit trail' analysis. While all of these techniques help researchers understand students' learning processes, all are limited in that they rely either on self-report or behavioural information to speculate about the cognitive activity of users. The use of functional brain imaging techniques has the potential to address this limitation. Drawing on issues encountered during a current study using Functional Magnetic Resonance Imaging (fMRI), this paper discusses the key methodological issues involved in the use of these techniques for exploring interactivity and cognition.

Keywords: interactivity, cognition, multimedia, functional brain imaging, fmri, learning

Introduction

This paper describes the methodological issues encountered during a current project exploring cognition and interactive multimedia using a combination of functional brain imaging and traditional behavioural and self-report measures. The paper begins with a discussion of the problem addressed and the traditional methods for exploring it. It is then argued that the addition of functional imaging methods has promise in addressing aspects of the problem. The research questions and research design in the current project are then explained, followed by a discussion of the methodological issues encountered during the project so far.

The problem

For nearly 50 years researchers have been investigating the design of Computer-Assisted Learning (CAL) resources and their contribution to learning. More recently Interactive Multimedia (IMM) resources have become a particular focus of this research. It is generally acknowledged that the key advantage such resources have over alternatives such as video, is the capacity for high levels of learner–computer interaction and engagement (Rieber, 2005). Many have observed that children and young adults are more easily engaged through the use of computer games than through any part of their formal education or schooling. Consequently, it is generally agreed that there is great potential for the use of interactive multimedia learning resources if similar levels of engagement to computer games can be achieved (Gros, 2003), and if tasks to be undertaken using the resources can be designed in such a way as to be authentic and aligned to the desired learning (Bennett, 2006; Dalgarno & Harper, 2004).

The high level of user–computer interactivity that occurs in computer games is central to the high degree of engagement facilitated by them. This interactivity has also been highlighted as a key feature of interactive multimedia resources that can lead to learning advantages. It has been suggested that interactive learning tasks carried out in the context of an authentic, problem-based scenario will result in deeper, elaborative cognitive processing leading to greater conceptual understanding of the material presented (Rieber, 2005). Additionally, the value of active learning processes over passive alternatives has been well established (Jonassen, 1991; Piaget, 1973). A crucial focus of ongoing research has been the nature of the learner–computer interaction and the connection between the different types of interaction and the desired learning (Sims, 1997). More recently it has been acknowledged that any model of learner–computer interaction must incorporate cognition as a central element, or put another way the cognition that occurs through this interaction is of central importance in predicting the learning that will occur (Dalgarno, 2004; Kennedy, 2004).

Drawing on this body of prior research then, the aim of our current research is to discover how interactivity in multimedia environments impacts on users' cognitive processes and subsequent learning outcomes.

Traditional methods

Research methods that have been used to investigate cognition and learning have traditionally included observation, self-report questionnaires, focus groups, interviews and think-aloud protocols (Miles & Huberman, 1994; Ericsson & Simon, 1993). In educational technology and human–computer interaction research these methods have been supplemented by the use of interaction log file or 'audit trail' analysis (Kennedy & Judd, 2004). While all of these techniques help researchers understand students' learning processes, all are limited in that they rely either on self-report or behavioural information to speculate about the cognitive activity of users. Consequently, although there is still a great deal that can be accomplished in addressing our research problem using these traditional methods, there appears to be value in also looking beyond these methods.

Alternative: The addition of functional brain imaging

An alternative approach to exploring cognition is to use functional brain imaging methods, such as Functional Magnetic Resonance Imaging (fMRI) or Positron Emission Tomography (PET), to identify the brain activation occurring during certain tasks. In recent years, with the increased availability of the equipment needed for these methods, the new field of *cognitive neuroscience*, which draws on physiological imaging techniques from neuroscience as well as behavioural techniques from psychology and theoretical approaches from cognitive science, has contributed to a range of problems previously explored only using behavioural methods (Churchland & Sejnowski, 2000; Gabrieli, 2005). Although functional brain imaging techniques have been used in neuroscience for more than 20 years, the widespread use of such techniques within psychology, cognitive science and education has only occurred within the last five to 10 years. There have, however, already been an enormous number of published studies. Consequently, the equipment, materials and procedures are now very well established and there are commonly accepted protocols for ensuring the safety and comfort of participants (see, for example, National Health and Medical Research Council, 2005).

Most of the research to date using functional brain imaging methods has focussed on the identification of brain regions activated while the participant undertakes a particular cognitive task (that is, with a goal of identifying the neural-correlates of these tasks). The tasks used are typically very basic, such as verbal memory tasks or simple problem solving tasks, such as the 'Tower of London'. This research has led to a large body of results associating brain areas with types of cognition. This large body of data can potentially be drawn upon in interpreting the results of functional imaging studies involving more holistic tasks, such as problem-based learning tasks using interactive multimedia. For example, if a region of the brain associated with the storage of semantic information in long term memory is found to be activated to a greater extent during an interactive task than during attendance to the same information in a non-interactive fashion, then it could be concluded that the interactivity contributes to retention. It is important to point out, however, that the cognitive neuroscience results to date have not established a one-to-one relationship between cognitive tasks and brain areas. Cognitive tasks typically result in activation of a range of brain areas, and certain brain areas are activated by a range of different cognitive tasks. This is particularly the case for tasks involving higher order thinking. For example, any task involving problem solving will typically also involve storage and retrieval of information from working memory and often also from long-term memory. Nevertheless, we believe that there is sufficient data available to allow conclusions to be drawn about the degree to which brain activation data is consistent or inconsistent with accepted theories of learning. This can be done by comparing the cognition implied by brain activation measured during the use of interactive multimedia with the cognition proposed by theory.

Overall research design and specific research questions

We are currently working on a pilot study addressing specific aspects of the relationship between interactivity, cognition and learning outcomes. The study involves a comparison of the cognitive processing and learning outcomes occurring through the use of two distinct types of multimedia program: a tutorial-based design and an interactive simulation-based design. In addressing this issue, we are using a combination of traditional methods with functional brain imaging methods. We have developed simulation-based and tutorial-based multimedia resources addressing two learning domains (global warming and blood alcohol concentration) and we are exploring cognitive processing and learning outcomes using the following data collection methods:

- written pre-tests and post-tests on declarative knowledge and conceptual understanding
- questionnaires on engagement and intrinsic motivation
- audit trail methods to explore behavioural interactivity
- stimulated response interviews involving the playback of the participant's recorded interactive session during an interview, in order to capture the participant's reflections on their own cognitive processing, and
- Functional Magnetic Resonance Imaging (fMRI) to measure brain activation.

The following specific research questions will be addressed by the study:

- Is there a detectable difference in the overall brain activation between users of a simulation-based and a tutorial-based multimedia learning resource?
- If so, does this difference explain predicted differences in the learning processes and outcomes of users interacting with these two types of resources?
- Is brain activation during identified interactive episodes (while using an educational multimedia resource) consistent with the cognition predicted by accepted theory?

Hypotheses

In order to identify brain activation differences expected between the simulation and tutorial-based conditions, it is necessary to first identify the differences in cognition predicted by theoretical and empirical research in educational technology and educational psychology. This research suggests that users of simulation-based multimedia would be expected to experience the following types of cognitive processing to a greater extent than users of tutorial-based multimedia:

- Deep *elaborative processing* and cognitive organisation and reorganisation of information, due to the requirement for the learner to regularly draw on their current understanding as they make decisions and attempt to predict how the simulated environment will respond in order to reach a task goal (see Craik & Lockhart, 1972; Wittrock, 1994; Norman & Schmidt, 1992).
- Greater degrees of self-reflection and *metacognitive self-monitoring*, as a result of observing the regular provision of *feedback* in the form of system responses to actions undertaken within the environment.

Drawing on research from cognitive neuroscience, we can then generate hypothesised brain activation associated with each of these types of cognitive processing. The following are some of the key associations:

- The *hippocampus*, the *dorsolateral prefrontal cortex (DLPFC)* and the *ventrolateral prefrontal cortex (VLPFC)* have been associated with elaborative processing and cognitive organisation (Fernandez & Tendolker, 2001; Gazzaniga, Ivry & Mangun, 2002; Blumenfeld & Ranganath, 2006; Prince, Daselaar & Cabeza, 2005);

- Feedback based learning has been found to result in activation of the *basal ganglia*, including the *striatum* and the *caudate nucleus* along with areas of the *prefrontal cortex (PFC)* and the *posterior frontomedian cortex (pFMC)* (Shahomy et al., 2004; Little et al., 2006; Volz, Schubotz & Yves von Cramon, 2005);
- Tasks requiring error detection and monitoring of activity and requiring choices to be made have been found to activate the *anterior cingulate cortex (ACC)* and where conflicting options are available, pFMC activation has been found (Elliot and Dolan, 1998; Ullsperger & Yves von Cramon, 2004);

An annotated diagram from *Scientific American* showing the main areas within the brain, including most of those mentioned above can be found in Graham (2006).

Imaging methods

The two most common brain imaging techniques, Functional Magnetic Resonance Imaging (fMRI) and Positron Emission Tomography (PET), provide an indication of the specific areas of the brain that are activated while a person is undertaking a particular task (Cabeza & Kingstone, 2001). FMRI involves the measurement of regional fluctuations in magnetic fields, which correlate with blood flow and in turn brain activation. The participant lies with their head and upper body inside the scanner, and with their head completely still (see Figure 1). A projected computer image is viewed via a mirror above the participant’s head and interaction occurs using simple hand-held buttons or a special purpose mouse. Headphones and a microphone can be used to communicate with the participant, although subtle head movements associated with speech make it difficult to measure activation while the participant is talking (Huettel, Song & McCarthy, 2004). The cost ranges from about $A900 to about $A1500 per participant (Brain Research Institute, 2006).

Figure 1: A Magnetic Resonance Imaging (MRI) scanner (Brain Research Institute, 2006)

When using PET the participant is first injected with a tracer radionuclide. This tracer travels through the bloodstream and is metabolised within the brain, leaving a signature corresponding to blood flow to each brain region. Positrons are emitted during the decay of the tracer and these are detected during scanning. The two key alternatives for PET are short half-life, water-based, and long half-life, glucose based radionuclides. When using water-based radionuclides, which decay in a matter of minutes, the participant is repeatedly injected while they undertake tasks with their head inside the scanner. This approach to functional imaging is becoming quite rare because the costs and risks to the participant are greater than fMRI, while the type of data obtained is similar but is generally not as accurate. However, an alternative approach using longer half-life glucose based radionuclides has distinct advantages for some types of studies. Because the half-life of these radionuclides is over 100 minutes, the participant, after being injected, can carry out tasks on a computer outside of the scanner and undergo scanning once the task is complete. This technique allows the overall activation to be measured, rather than the activation at discrete moments during the task, but the ability to carry out tasks outside of the scanner leads to greater task authenticity and consequently greater external validity in the findings (Cabeza & Kingstone, 2001).

In our study we have chosen to use fMRI because of our interest in the brain activation occurring at discrete moments during an interactive session. Although water-based PET can also be used to gather this data, fMRI is less physically intrusive, involves less risk for the participant, provides greater temporal fidelity through more frequent scans, is more readily available and is less costly.

There are two common approaches to experiment design for functional imaging studies. The first is a *block design*, whereby a series of stimuli of a similar type are presented in a block. For fMRI the block length is typically about 30 seconds and there might be around 60 blocks of stimuli presented during the session. Activations can be compared across two or more stimuli or alternatively activation during the stimulus condition can be compared to activation during a regular *baseline* or rest condition. The alternative is an *event-related design*, where the participant's interactions define *events* which are categorised prior to analysis. Analyses in our study include comparisons of overall activation across the two conditions as well as the use of event-related methods to compare activation during identified categories of interactive task.

Multimedia design

Our original intention was to use an existing multimedia resource for the simulation condition. The resources we had in mind provided an interactive simulation as the central component, supplemented by text-based and graphical support materials. Such resources allow complete learner control over their exploration within the resource. Our intention was to produce a tutorial resource based primarily on the text-based and graphical supplementary material within the resource, structured in a lock-step sequence with control only over the pace that the information was presented.

As our understanding of fMRI methodology increased through discussions with experienced researchers along with extensive reading, we realised that to use our intended multimedia designs would result in an experimental design that departed substantially from accepted practice in fMRI research. The following were the key methodological problems with our intended approach:

- The complex physical interaction in the simulation condition could confound the results because it would be difficult to differentiate between brain activation associated with the motor tasks and brain activation associated with the cognitive task.
- The visual differences between the simulation and tutorial conditions could confound the results because it would be difficult to differentiate between the brain activation associated with attending to the rich multimedia content in the simulation condition from the activation associated with the cognitive task.
- It would be difficult to provide a regular baseline or rest stimulus within the simulation condition if we allowed complete learner control.

These constraints initially were a source of great frustration to us. We were very keen to use a simulation condition that was as authentic as possible so that the results obtained would be applicable to naturalistic settings. Having to decide on an appropriate compromise between internal and external validity is common in educational research using an experimental design. Greater control over variables normally increases the internal validity but decreases the external validity and thus the applicability of the findings to authentic settings. In this case, however, we initially felt that the compromises we would have to make would have too detrimental an effect on external validity. Upon further analysis, however, we came to the conclusion that an experiment with a great deal of control over the differences between the two conditions would provide us with some very important initial results. We also felt that carrying out our first fMRI study using a design somewhat similar to conventional fMRI studies would be sensible. Once we had developed greater knowledge of the methodological issues and analysis techniques we would be in a better position to consider departing from convention by using more holistic tasks and perhaps a greater degree of qualitative analysis of the brain activation data.

In addition to the methodological issues associated with our intended multimedia designs, we were also constrained by the fact that an MRI compatible mouse was not available to us. Because of the use of powerful magnets in MRI, it is unsafe to use any device that emits electromagnetic radiation in the scanner and consequently special purpose devices using optical rather than electrical signals are required.

An MRI compatible mouse has recently become available overseas but our budget did not allow us to purchase one and we were unable to find anybody using one in Australia. Consequently, it was necessary to develop new resources or substantially tailor existing resources so that they used a push-button interface.

Ultimately, we decided to develop our resources from scratch, although in one case we drew on an existing resource for the simulation model. Using Macromedia Director, we have developed four multimedia resources, a tutorial and a simulation resource in each of two learning domains. The domains chosen were global warming and blood alcohol concentration. These topic areas were chosen due to their mainstream interest, the fact that misconceptions exist about each, and our view that substantial learning was possible without a great deal of prerequisite knowledge. It was necessary to choose two learning domains because fMRI analysis must initially be carried out within subject, and thus it was necessary for each participant to use both a tutorial and a simulation resource. Within subject analysis is necessary because cerebral blood flow varies greatly across the population, and so absolute blood flow for one participant cannot be compared to absolute blood flow for another participant. To control for differences in complexity in the learning outcomes we decided to develop a tutorial and a simulation resource in each domain. With eight participants, this has allowed us to use a balanced design, controlling for order effects and domain complexity effects.

Screen images from the developed resources are shown in Figures 2, 3 and 4. The following are the key aspects of their design:

- Each resource is divided into two parts, a background section and a main section.
- The background section, common to the simulation and tutorial versions, consists of a series of screens containing background information about the problem domain. This information is not accessible once the participant moves to the main part of the resource but they can spend as much time reading this background information as they wish and they can move backwards and forwards through the screens within it.
- The main part of the tutorial and simulation versions has been designed with identical screen layouts, with the main part of the tutorial resource consisting of a series of output screens from the simulation, annotated with a text explanation but without the ability to control the simulation parameters.
- The simulation resource is structured so that participants plan their manipulations on one screen, carry out their manipulations on another, and view feedback on a third screen.
- Both the tutorial and the simulation resource contain a regular baseline or rest stimulus condition, consisting of random numbers and graphs and an animated highlight.
- In the tutorial resource, once the participant finishes reading the background information, they view a series of simulation output screens with the baseline screen displayed between each. In the simulation resource, once the participant finishes reading the background information, they view a repeated sequence of planning, manipulation, feedback and baseline screens.
- Interaction occurs through the use of a 4-button device. The resources have been programmed to use three of these buttons, with the left and right button moving a highlight forwards and backwards between options on the screen, and the middle button activating the highlighted option.

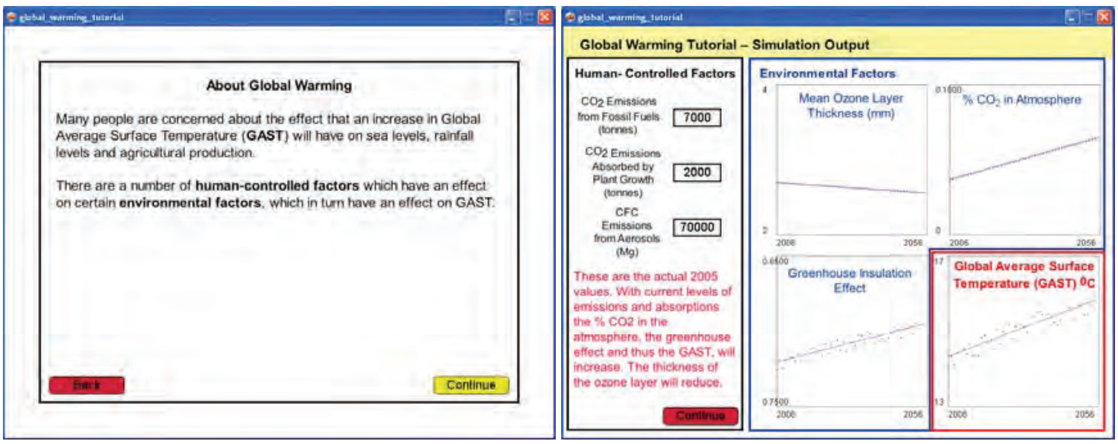

Figure 2: Example background screen from the global warming simulation and tutorial resources (left) and example simulation output screen within the global warming tutorial resource (right)

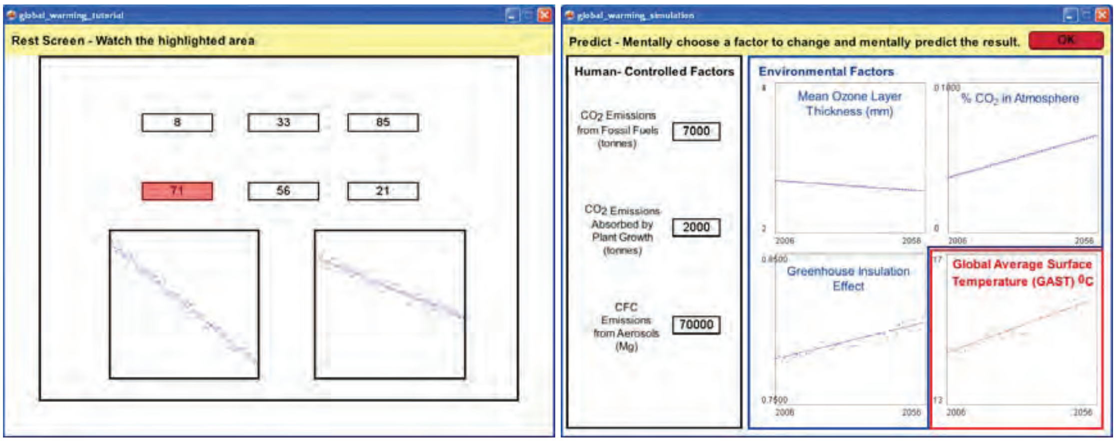

Figure 3: Example rest screen (left) and example planning screen from the global warming simulation resource (right)

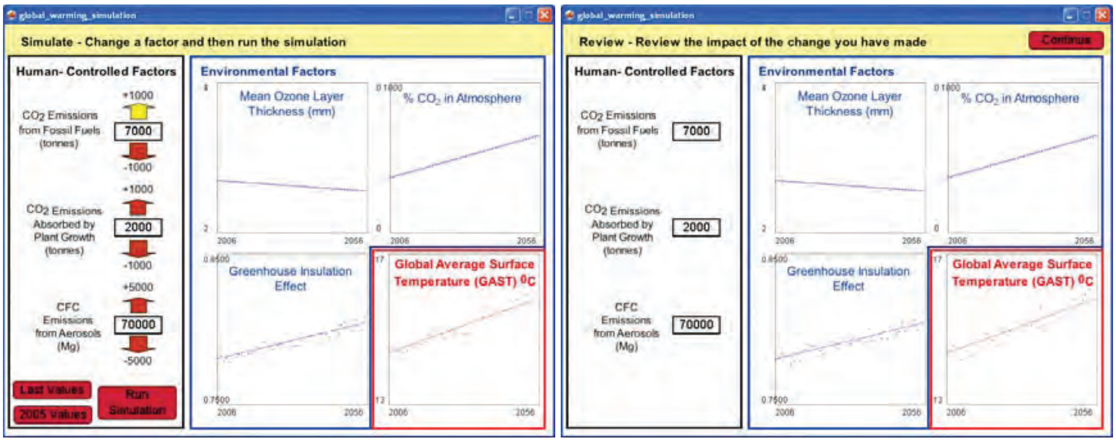

Figure 4: Example manipulation screen (left) and example feedback screen (right) from the global warming simulation resource

Pilot studies

We have undertaken two stages of pilot testing of the resources and research instruments without the use of fMRI and have so far undertaken one stage of pilot testing using fMRI. We are planning another stage of fMRI pilot testing before we undertake the main study. In the first pilot study, a single participant used the global warming simulation resource. The following are some of the key changes made as a result of this pilot:

- A back button was added to the introductory section because the participant indicated that she wanted to refer back to earlier sections.
- Explanatory information including an annotated example simulation output screen was added to the background section to resolve confusion about the values within the simulation and their units.
- An explicit goal of stabilising the global temperature was added to the instructions within the background section because it was found that when, about half-way through the task, the participant fixed on this goal, she became more directed in her exploration.
- More detailed explanations about what to do on each screen were added to the background sections because the participant initially found that expectations about what to do on each type of screen (planning, manipulation and feedback) were unclear.
- The movement of the highlight on the baseline screen was made random because the participant found herself trying to predict its movement and the resource was reprogrammed to run full screen because the participant began attending to the icons on the computer's desktop.
- Changes were made to the pre-test and post-test to address various ambiguities and limitations identified.

In the second pilot study two participants each used one simulation resource and one tutorial resource. The following are some of the key changes made to address issues that emerged during this pilot:

- Both participants found it difficult to organise their thinking in the intended way within the simulation resource. For example, one participant undertook her planning during each baseline screen and then skipped straight over each planning screen. To address this, a preparatory talk was developed, including the use of printouts of screen images, to help explain to participants how important it is that they organise their thinking according to the instructions provided.
- The scenarios in the blood alcohol tutorial were redeveloped to eliminate an identified bias towards male participants.
- Changes were made to the blood alcohol pre-test and post-test to address ambiguities and limitations identified.

In the first fMRI pilot study a single participant used the blood alcohol simulation while in the MRI scanner. It was our intention that this participant would also use the global warming tutorial resource and we also intended to have a second participant use the other two resources as part of the pilot. However, we encountered problems in the visibility of the screen from within the MRI scanner and decided instead to carry out a fourth pilot study after addressing this issue. Specifically, the participant initially found that she could not see the whole screen area through the mirror within the MRI scanner. When the projected screen area was reduced in size, she found that she could not read certain sections of text within the resource because the fonts were too small. The other problem that emerged during this pilot was difficulty with playing back the animated screen image captured using Camtasia Studio with sufficient control during the interview. Alternative video playback software is being explored with a view to using a package that allows rapid controlled scrolling through the recorded session.

Pilot testing of research protocols is essential in any research, but we found it particularly important in this research due to the innovative nature of the methods used. As well as using all of the various types of data gathering described above, we also asked additional interview questions in these pilot studies in order to evaluate the suitability of the multimedia resources and the various research instruments. We found these interviews particularly useful as a way of exploring the thinking process and learning approaches of the participants. The ability of the participants to follow the strategy implicit within the simulation resource designs, and in particular to carry out the various types of thinking at the right time, or while looking at the right screens, will be essential in analysing the brain activation data. We found that participants were not always able to follow our instructions in this respect, and as a result we have tailored the way we prepare our participants.

Next step: Analysis

The next stage in the project will be to analyse the data from the fMRI pilot study. The focus of this analysis will be an exploration of the blood flow (and thus activation) during the planning, manipulation and feedback screens relative to activation during the baseline screen. The analysis process requires the use of specialised software. We will be using a package called Statistical Parametric Mapping (SPM), a set of library routines or plug-ins for MatLab. The following is a summary of the main steps that have to be carried out in the analysis:

- The data is run through a motion correction algorithm to correct the data during periods when the participant's head was not absolutely still.
- The data is then run through a slice timing correction algorithm to adjust for the fact that it takes around 3 seconds for a complete image to be acquired, during which there may be changes in activation.
- Temporal filtering is then carried out to correct for low frequency changes in blood flow during the session, for example changes associated with the participant's mood changes.
- The data is then transformed to a 'standard' brain map to allow for differences in the size and shape of participants' brains to be taken into account when comparing activations across participants.
- The time-codes of each 'block' of stimuli or each 'event' are then specified (in our case, the time-codes when the participant moves from one screen to another).
- A General Linear Model (GLM) is then fitted to the data to determine whether there are statistically significant differences in activation between conditions.

In analysing the data for the first fMRI pilot, we are expecting to find activation of brain areas associated with planning, decision making and cognitive organisation corresponding with periods when the participant was on the planning screen, and activation of brain areas associated with feedback, error detection, and elaborative processing corresponding with periods when the participant was on the feedback screens. If such activations are able to be identified, this will give us confidence that our multimedia resources and task instructions are appropriate as we move towards the final fMRI pilot. The data from the final fMRI pilot will be analysed to determine whether there are detectable differences between activation during the tutorial-based and simulation-based conditions. We will then be ready to commence the main study.

Conclusion

This paper has described the methodological issues encountered during a study involving the use of fMRI along with traditional behavioural and self-report measures to explore the cognitive processing occurring while using a simulation-based and a tutorial-based multimedia resource. Although findings in relation to the research questions are not yet available, substantial development in our understanding of the methodological issues has occurred. We began the project with a degree of healthy scepticism. Our findings to date suggest that there certainly are some important limitations in the types of learning tasks that can be explored using fMRI and thus the types of questions that can be addressed. Despite this, we feel that the area has great promise and that with appropriate experimental design it will be possible to develop a deeper understanding of cognition and interactivity through the use of fMRI in conjunction with traditional methods than would be possible through traditional methods alone.

References

Bennett, S. (2006). Using related cases to support authentic project activities. In A. Herrington & J. Herrington (Eds.), *Authentic Learning Environments in Higher Education* (pp. 120–134). Hershey, PA: Idea Group Inc.

Blumenfeld, R. S., & Ranganath, C. (2006). Dorsolateral prefrontal cortex promotes long-term memory formation through its role in working memory organization. *Journal of Neuroscience*, *26*(3), 916–925.

Brain Research Institute (2006). The Brain Research Institute, Melbourne, Australia. Retrieved July 21, 2006, from http://www.brain.org.au

Cabeza, R. & Kingstone, A. (2001). *Handbook of functional neuroimaging of cognition*. Cambridge, MA: MIT Press.

Churchland, P. S., & Sejnowski, T. J. (2000). In M. S. Gazzaniga (Ed), *Cognitive Neuroscience: A Reader* (pp. 14–24). Malden, Mass: Blackwell.

Craik, F.I.M. & Lockhart, R.S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behaviour*, 11, 671–684.

Dalgarno, B. (2004). A classification scheme for learner–computer interaction. In R.Atkinson, C.McBeath, D. Jones-Dwyer and R.Phillips (eds) *Beyond the comfort zone, 21st annual conference of the Australasian Society for Computers in Learning in Tertiary Education*, (pp. 240–248). Perth, Australia.

Dalgarno, B. and Harper, B. (2004). User control and task authenticity for spatial learning in 3D environments. *Australasian Journal of Educational Technology*, 20(1), 1–17

Elliott, R. & Dolan, R.J. (1998). Activation of different anterior cingulate foci in association with hypothesis testing and response selection. *NeuroImage*, 8(1), 17–29.

Ericsson, K. A., & Simon, H. (1993). *Protocol analysis: verbal reports as data*. Cambridge, MA: MIT Press

Fernández, G. & Tendolkar, I. (2001). Integrated brain activity in medial temporal and prefrontal areas predicts subsequent memory performance: Human declarative memory formation at the system level. *Brain Research Bulletin*, 55(1), 1–9.

Gabrieli, J. (2005). *Educating the Brain: Lessons from Brain Imaging*. Retrieved August 29, 2005, from http://www.educause.edu/content.asp?page_id=666&ID=FFP0510S&bhcp=1

Gazzaniga, M.S., Ivry, R.B. & Mangun, G.R. (2002). *Cognitive neuroscience: The biology of the mind*. W.W. New York: Norton & Company.

Graham, B. (2006). *Computing and the Brain*. Retrieved July 21, 2006 from www.cs.stir.ac.uk/courses/31YF/Notes/Notes_OV.html

Gros, B. (2003). The impact of digital games in education. *First Monday*, 8(7).

Huettel, S.A., Song, A.W., & McCarthy, G. (2004). *Functional Magnetic Resonance Imaging*. Sunderland, Mass: Sinauer Associates Publishers.

Jonassen, D. H. (1991). Objectivism versus constructivism: Do we need a new philosophical paradigm? *Educational Technology Research and Development, 39*(3), 5–14.
Kennedy, G.E. (2004). Promoting cognition in multimedia interactivity research. *Journal of Interactive Learning Research*, 15(1), 43–61.
Kennedy, G.E. & Judd, T.S. (2004). Making sense of audit trail data. *Australasian Journal of Educational Technology, 20* (1), 18–32.
Little, D.M., Shin, S.S., Sisco, S.M. & Thulborn, K.R. (2006). Event-related fMRI of category learning: Differences in classification and feedback networks. *Brain and Cognition*, 60(3), 244–252.
Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.
National Health and Medical Research Council . (2005). *Human Research Ethics Handbook: Research Involving Radiation*. Retrieved August 26, 2005 from http://www.nhmrc.gov.au/publications/hrecbook/02_ethics/35.htm
Norman, G.R. & Schmidt, H.G. (1992). The psychological basis of problem-based learning: A review of the evidence. *Academic Medicine*, 67(9), 557–565.
Piaget, J. (1973). *To understand is to invent: The future of education*. New York: Grossman Publishers.
Prince, S. E., Daselaar, S. M., & Cabeza, R. (2005). Neural correlates of relational memory: Successful encoding and retrieval of semantic and perceptual associations. *Journal of Neuroscience*, *25*(5), 1203–1210
Rieber, L.P. (2005). Multimedia learning in games, simulations and microworlds. In R.E.Mayer (Ed), *The Cambridge Handbook of Multimedia Learning*, New York: Cambridge University Press.
Shohamy, D., Myers, C. E., Grossman, S., Sage, J., Gluck, M. A., & Poldrack, R. A. (2004). Cortico-striatal contributions to feedback-based learning: Converging data from neuroimaging and neuropsychology. *Brain*, *127*(4), 851–859.
Sims, R. (1997). Interactivity: A forgotten art? *Computers in Human Behaviour*, 13(2), 157–180.
Ullsperger, M. & Yves von Cramon, D. (2004). Neuroimaging of performance monitoring: Error detection and beyond. *Cortex*, 40(4–5), 563–604.
Volz, K.G., Schubotz, R.I., Yves von Cramon, D.Y.(2005). Frontomedian activation depends on both feedback validity and valence: fMRI evidence for contextual feedback evaluation. *NeuroImage*, 27(3), 564–571
Wittrock, M.C. (1994). Generative Science Teaching. In P.J. Fensham, R.F. Gunstone and R.T. White (eds), *The Content of Science*, (pp. 29–38). London: The Falmer Press.

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Whose assessment in a problem based learning medical program?

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This paper describes work in progress of an electronic assessment project at the University of Sydney. The Faculty of Medicine has developed an online format for the Modified Essay Question (MEQ) written assessments used in its problem based learning (PBL) medical program. The MEQ is used to assess a student's approach to a problem, particularly their reasoning skills and understanding of concepts. The goals of this project include assisting students perform optimally in the MEQ assessment, implementing improvements to the efficiency of written assessment administration and enhancing the quality of feedback to students. Four trials of the online MEQ have now been conducted. Faculty and student feedback on all four trials have been very positive. Students have reported that they have more time to plan and draft their answers and that the electronic format is more motivating than using the traditional paper assessment format. Faculty staff have reported that the online MEQ reduces the burden of marking student answers, while also improving the provision of student feedback. This project is attempting to meet the assessment challenges faced by a medical school with large student enrolment numbers by efficiently assessing the application of knowledge and clinical reasoning in a PBL context.

Keywords: online, assessment, medical education, problem based learning

Introduction

The University of Sydney Medical Program (USydMP) is a four year course with graduate entry. The medical program is problem based and designed to be student-centred in the sense that it is based on student participation in PBL tutorials. In the first 2 years, students in groups of eight or nine are presented with a virtual patient at the beginning of each week, and begin to analyse the patient's problem before they receive any other campus sessions (for example, lectures or practical classes). Patient problems are grouped into approximately seven week long blocks of study. The blocks of study are based on body systems (for example, respiratory, cardiovascular and gastrointestinal).

The two major written assessment instruments used in the USydMP are the Single Best Answer (SBA) question (a type of multiple choice question in which the student has to choose the best of four alternatives), and the MEQ in which the student has to write answers to a sequence of questions based on a patient's problem.

Students sit three formative written assessments prior to completing their first summative assessment towards the end of Stage 2 of the program. The SBA papers are computer marked, but until the recent development of the electronic Modified Essay Question (eMEQ) instrument, MEQ papers have used a traditional paper assessment format and have required marking by hand. When the graduate entry USydMP began about ten years ago with around 100 students, the marking load was considered by Faculty as not too much of a burden. However the current intake is approximately 300 students per year and this burden has become much more prominent.

Development of the eMEQ

The MEQ in medical education

The MEQ instrument has been used in a number of medical programs both nationally and internationally. The MEQ is particularly suitable in assessing students' response to a problem, particularly their reasoning skills and understanding of basic and clinical science concepts. It is a case-based approach to assessment and can be seen to be consistent with students' learning in a PBL program.

Each case in an MEQ paper requires students to proceed through a patient problem in a sequential manner much like a PBL tutorial. The items (or questions) of the MEQ address the clinical reasoning steps sequentially. The first items usually explore the diagnostic hypotheses, and mechanisms underlying the clinical presentation. As the clinical scenario evolves, items may focus more specifically on interpretation of investigations, and management issues. Understanding and knowledge of basic science mechanisms and concepts related to the clinical problem can be assessed at any point during the paper. Community and Doctor, Evidence Based Medicine and ethical issues can also be incorporated into the MEQ format. With the unfolding of the patient problem, new information will be presented that may provide students with the answer to an earlier question. In this way the MEQ can mimic clinical practice in the sense that it tries to represent a patient's problem developing over time, while requiring the student to use what is known at any one point to make appropriate decisions about diagnosis and treatment. For MEQ assessments students are not permitted to preview the outcome of the problem or to turn back to change previous answers. This feature requires that the student to comply with the rule that the MEQ is a "no look back and no look forward" assessment.

The eMEQ from the faculty's perspective

The eMEQ was developed with a number of goals clearly in mind.

Firstly with the large growth in enrolments since the beginning of the new millennium, the burden of marking assessments has grown significantly. It was hoped that an electronic format would make the marking process more efficient and absorb less time than the traditional paper format.

Secondly, the paper MEQ format requires extensive invigilation to ensure that students comply 'no look back and no look forward' rule. This requirement means that a typical summative assessment may necessitate having up to between seven and ten invigilators within an assessment venue to ensure student compliance. The eMEQ however electronically enforces the rule.

Thirdly, to ensure marking quality, the eMEQ was developed to allow for each student answer to be reviewed independently by a number of assessors and inter-marker reliability assessed. Additionally, individual marker's own mark-remark reliability can be calculated.

Fourthly, it was anticipated that the eMEQ format would improve markers' reading of answers through a combination of the minimisation of layout problems and the absence of the many instances of illegible handwriting that characterise paper answer formats.

Fifthly, statistical data on each question and case would be available to examination committees as a part of the assessment review process. The statistical information available would include the discriminator, percentage correct (the percentage of the number of students that submitted a correct response for this question/number of responses) and so on.

Trialling the eMEQ

Different perspectives on the eMEQ

Four trials of the eMEQ have been conducted involving approximately one hundred students and twenty Faculty staff and roll-out is planned for early 2007. Faculty and student feedback on all trials have been very positive. Although there is some concordance in elements that both Faculty members and students find positive about the eMEQ experience (for example, improvements to legibility of answers in the online format compared to the paper format) there are some interesting differences in perspective which prompt questions suggested by the title of this paper. These questions include:

- Is the eMEQ designed primarily for the benefit of Faculty assessors or to improve the assessment experiences of medical students?
- How can we apply the different perspectives of assessors and students to develop more effective assessment instruments in PBL medical programs?
- What theoretical directions for further research are suggested by the perspective of students in particular?

Faculty have reported that the eMEQ facilitates marking and student feedback processes and enables examiner feedback comments to be appended electronically to students' answers, in this way saving time. The following quotes from Faculty markers illustrate these positive features of their experience of the eMEQ:

- Much quicker than messing around with booklets and papers;
- Marking interface is pretty good;
- No handwriting reading problems (really brilliant!) and therefore I can keep a constant speed up in my marking;
- Much more convenient - I can work around my other commitments at hospital much more easily.

On the other hand students have reported that they have more time to plan and draft their answers and that the electronic format is more motivating than using the traditional paper assessment instrument. The following student comments exemplify the main elements of the student perspective:

- It's much easier to formulate answers and edit as you go along;
- Relaxed and fast;
- Great for people who can type quickly (and can think better/faster when they type);
- Techno-cool image like in those movies in the future where they all do school at home and stuff. That's cool!

It would appear from a student perspective using the eMEQ improves the quality of their assessment experience as well as providing a format for students to plan and write their responses. Students value the occasion to use a keyboard rather than a pen, to view online images (e.g. X rays and brain scans), rather than look at printed pictures, and to write their answers in an examination context that is perceived to be more fashionable and 'cool' than the traditional examination room with hundreds of tables.

Students may also value the opportunity to plan and edit their answers in such a way that allows them to demonstrate a more elaborate understanding of medical concepts than may be expressed in the more traditional paper format.

Research implications of the eMEQ

Although Faculty and student reports are both overwhelmingly positive, feedback on the eMEQ experience also suggests some very interesting research directions for the use of online assessments in a PBL context. Table 1 summarises student feedback on the trials of the eMEQ and indicates some possible directions for further research.

The capacity to plan answers was highly rated by many students involved in the four trials of the eMEQ. Being able to provide a planned response and to effectively apply basic and clinical science knowledge to patient problems are key competencies for students in the USydMP. If through the use of the eMEQ format these competencies are not only assessed but also supported, we will be doing a good job as teachers and assessors.

The motivating effect of doing an online assessment was not as frequently commented on (as other topics) in the collection of written student feedback. However during a number of briefing sessions with students, this topic was frequently raised in discussion as a major reason for doing this form of online assessment. A research direction suggested by this student feedback is to consider researching ways in which we can develop assessment instruments that build on the benefits of motivation and the investment of mental effort (Salomon, 1983, 1984).

Finally there were a number of themes raised by students which suggest that the eMEQ might have features which minimise the effects of extraneous aspects of the assessment task. These extraneous features and other distractions included minimising writer's cramp through the facility of typing (as opposed to hand-writing), and having a more comfortable venue for examinations. Pass et al. (2003) describe the work of Gerjets and Scheiter who have emphasised the role of minimising extraneous cognitive load, while aiming to free up the learners' possibilities of germane or effective load. This suggests an interesting direction for our research as we prepare for roll-out of the eMEQ in November 2006.

Table 1: Summary of student feedback and possible directions for further research

Student feedback	**Sample student comments**	**Possible research directions Research aimed at …**
Capacity to plan answers	It's much easier to formulate answers. The eMEQ [gives me] the ability to move text around and add extra sentences wherever I want	The development of assessment strategies that allow for more effective application of knowledge and planned responses to patient problems (Swanson et al., 2003).
Motivating	It's cool! I get nicely fired up by this exam.	The development of an assessment instrument that maximises the benefits of motivation and the investment of mental effort (Salomon, 1983, 1984).
Typing easier than writing by hand	I type faster. Typing is easier and quicker.	Minimising extraneous cognitive load and other distractions (Pass et al., 2003)
Clarity of images	MRIs and CTs are very clear.	The development of an assessment instrument which allows the freeing up germane cognitive load to respond more efficiently to a clinical problem (Pass et al., 2003).
Student comfort	There is no chance of writer's cramp. The computer room is a better environment to do the exam.	Minimising extraneous cognitive load and other distractions (Pass et al., 2003)

Conclusion

The eMEQ project has attempted to develop an assessment instrument that can mimic clinical practice in the sense that as data about a patient's problem emerges over time, students must apply what is known at any one point to make appropriate decisions about diagnosis and treatment. This project has lead to a number of important findings in terms of different perspectives of assessors and students on the experience of using the instrument. The next phase of the project will attempt to explore some of the interesting theoretical and research directions suggested by feedback from students. We aim to apply the theoretical implications of the student's perspective (as well as the assessors' perspective) to develop a more effective assessment strategy that meets the requirements of a graduate PBL medical program.

References

Pass, F., Renkl, A., & Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. *Educational Psychologist*, 38, 1-4.

Salomon G. (1983). The differential investment of mental effort in learning from different sources. *Educational Psychologist*, 18, 42-50.

Salomon G. (1984). Television is easy and print is tough. The differential investment of mental effort in learning as a function of perceptions and attributions. *Journal of Educational Psychology*, 76, 774-786.

Swanson, D., Case, S., & van der Vleuten, C. (2003). Strategies for student assessment. In D. Boud & G. Feletti (Eds), *The Challenge of Problem Based Learning* (pp. 269-282). London: Kogan Page.

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Re-purposing an online role play activity: Exploring the institutional and pedagogical challenges

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Migrating a proven learning design from one online teaching milieu to another is not always a simple process. Complications can arise on various fronts. From a pedagogical perspective, for instance, one of the main challenges is associated with the task of realigning the activity to adequately reflect the new curriculum context, delivery mode, target audience, learning process and anticipated outcomes. Similarly, institutional barriers such as intellectual property and the available online infrastructure and technical supports can also limit, and at times inhibit, reuse. Drawing on personal experience, this short paper discusses the challenges associated with re-purposing an online learning design across program, disciplinary and institutional contexts. Using a role play activity as the case study, this paper aims to stimulate discussion about the complexities and practicalities associated with the reuse of a proven learning design. Initially the original and re-purposed learning designs are outlined. Then, the pedagogical and institutional shifts that were required are discussed and a framework for analysing the dimensions of reuse is proposed.

Keywords: learning design, reusability, role play, pedagogical and institutional challenges

Higher education and reuse of learning designs

Unlike other educational providers, the higher education sector is not renowned for a strong culture of collaboration in terms of teaching and learning. Pre-packaged teaching resources and learning activities are often viewed with scepticism and the sentiment 'not invented here' is the common catch cry of dissent (Conole & Oliver, 2002). However, this culture is starting to shift, in part, as a result of the increasing use of the online environment for teaching and learning in both face-to-face and distance contexts. From a pedagogical perspective one explanation for this is the 'visibility' of the teaching and learning process afforded by the online environment. That is, in spite of its password-protected nature, the online learning environment presents a more public teaching space than that afforded by a classroom setting. What is taught and how it is taught becomes visible, and the teaching and learning processes are more open to scrutiny and critique. Further, academics making the move to an online environment often seek advice from educational specialists. The collegial nature of this type of interaction opens up yet another space for discussing teaching and learning, providing opportunities for re-evaluating and re-thinking past practices and/or approaches that may no longer be appropriate. With these factors in mind, coupled with the actual investments (staff time and resources) of developing an effective online learning experience, the ability to reuse learning activities and resources is gaining more currency and appeal in higher education.

It is hardly surprising then, particularly with the ever increasing financial and resource constraints currently faced by higher education institutions, that the benefits of being able to share and disseminate good teaching practice is now a key priority. Over the last few years, in fact, a number of different projects have been initiated to promote understanding about impediments to and strategies for propagating good practice within a higher education context. One such initiative was a project entitled 'Information and Communication Technologies (ICTs) and their Role in Flexible Learning' (see Learning Designs website). An outcome of this project, which explored the design of activities using ICTs, was the documentation of a number of exemplary learning designs; the online role play described in this paper is one of the chosen exemplars. Using the definition adopted by this project team the term 'learning design' is taken to mean the different ways in which learning experiences can be structured, including the sequencing of activities and interactions. It comprises three key elements: the content or resources learners interact with, the tasks or activities learners are required to perform, and the support mechanisms provided to assist learners to engage with the tasks and resources (Learning Designs website; Oliver, 1999).

This short paper begins by outlining the original role play activity. Understanding the structure and emphasis of the learning design is important as it helps to reveal some of the complexities associated with re-purposing this activity for use in another teaching and learning context. Having outlined the contextual shifts involved the broader implications of learning design reuse are briefly discussed.

The roundtable activity: The original learning design

The roundtable discussion (RTD) activity was originally developed for use in an undergraduate unit of study in the Departments of Physical and Human Geography at Macquarie University. It was designed using a role play approach and students were required to research a particular scenario, develop and question stakeholder positions, and take part in a roundtable meeting. This was an appropriate approach as role play is a recognised technique for situating learning about complex problems and social interactions (van Ments, 1989), particularly those that that defy ‘recipe book’ problem solving approaches. Key aspects of the role play activity were the application of evidence to real world issues, the appreciation of a range of stakeholder positions, and developing understanding that complex and contested situations can be resolved in practice (Brierley et al., 2002a; 2002b).

Activity structure

The activity was structured over a four (4) week timeframe. Week one was comprised of a face-to-face briefing session about the activity and the associated assessment requirements. Each student was allocated one of the sixteen stakeholder roles to play and instructed to research the general topic area using online and library resources. In week two, the students prepared and submitted their stakeholder position paper into the online classroom space. During the next week each student reviewed the other position papers and posted up at least one question on the discussion board to each stakeholder. Students used these questions to appraise, and sometimes modify, their original position paper. Week four was a face-to-face session where students participated in a role-play activity followed by debriefing. The activity also had a formal assessment component. Students were awarded marks for participation (based on their position paper and questions to other stakeholders) and a written paper (based on their understanding of the content and process of the roundtable discussion activity itself).

The activity used a blended delivery approach, incorporating face-to-face tutorials as well as online tasks and resources. The online component of the activity was supported by a purpose built teaching and learning interface embedded within the centrally supported learning management system (LMS). From a student perspective the interface formed an important learning space for the activity: it provided a visual representation of the roundtable meeting and a mechanism for uploading and reviewing stakeholder position papers. From a teaching perspective the administrative interface was user friendly and the process of allocating students to groups and specific roles was uncomplicated. The simplicity of this interface has been one of the critical factors in the sustainability of this learning design.

Re-purposing the learning design

The original RTD learning design has appeal across many teaching contexts, particularly those that aim to develop understanding about a diversity of viewpoints in relation to a complex issue, and skills in working effectively with other stakeholders to negotiate an outcome. From a health science perspective the RTD activity has application in that it provides students an opportunity to explore the multidisciplinary team approach in the management of complex health conditions. With this in mind, permission was sought to redevelop the original design for use in the Graduate Studies in Pain Management Program, an online coursework program offered through the University of Sydney.

While the originator of the learning design did not object to the reuse of the learning design the transfer of the activity across institutions was not a simple process of ‘plug in and play’. Rather, a number of issues had to be addressed. One was related to realigning the design to reflect the new curriculum context and learning outcomes, delivery mode and target audience: a process which Fill et al. (2006) refer to as ‘pedagogic repurposing’. Another was related to barriers associated with cross-institutional transfer of the purpose built online components of the activity, specifically the student and administrative interfaces. Key stumbling blocks were negotiations about the intellectual property of the purpose built aspects of the design, differences between the LMS supported by each institution and access to programming and technical support.

The re-purposed activity: Similarities and differences in the learning design

The re-purposed learning design activity was similar to the original RTD in a number of ways. Firstly, the activity used a role play approach built around a 'real life' scenario. The authentic nature of the task provided students with an opportunity to explore and question different stakeholder positions, discuss the management of a complex issue, and develop skills in negotiating an appropriate outcome. Secondly, the basic structure and sequence of the activity paralleled the original design. Students were allocated stakeholder roles and asked to develop position statements for the role play activity that followed. There was also an assessment component attached to the activity (online participation and written assignment).

Nevertheless, migrating the learning design across program, disciplinary and institutional contexts necessitated a number of changes to the learning design. First, the focus of the role play shifted from the management of an environmental issue to the management of a complex health condition. This led to changes in the scenario, number of role players, and assessment task. Changes in the delivery and facilitation of the activity were also required as the original learning design, which was incorporated into an undergraduate course, embraced a blended delivery approach. In contrast, the re-purposed design was to be embedded into an online postgraduate program that had been licensed to two other universities overseas. These differences demanded specific modifications such as an extended timeframe for the activity, targeted online supports and resources, and facilitator briefing and debriefing guides.

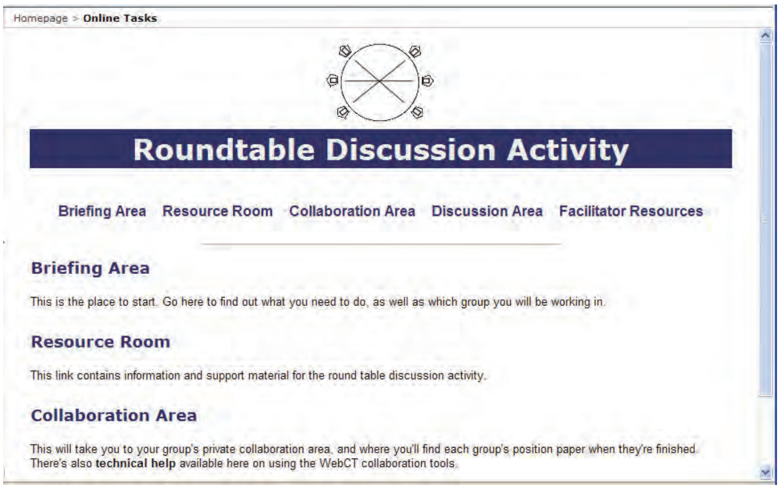

Figure 1: Re-purposed interface

The online component of the activity was an important feature of both learning designs. Initial plans in terms of re-purposing the learning design were to reuse the purpose built activity interface. However, as already noted, institutional barriers prevented this from actually occurring. Consequently, the re-purposed activity was built using the available tools within the centrally supported LMS. While this was not the most ideal solution, practically it was the only way forward. Using available tools the new activity interface was designed with the specific attributes of the original design in mind. One of these attributes was the visual representation of a roundtable, which helped to create a learning space for the RTD activity (see Figure 1). Another was the simplicity of the interface, from both teacher and student perspectives.

Role play learning design: Dimensions of reuse

As this case study illustrated the re-purposing of a learning design to another disciplinary and institutional environment is not always a simple process. Even with similar aims and outcomes the effective reuse of a proven learning design often demands the realignment of the activity to reflect the pedagogical and institutional context. With this in mind, a set of continua is proposed as an initial model for opening up discussion about the issues associated with the reuse of learning designs. This model, which adapts the ideas developed by Taylor et al. (1996), uses a slide rule analogy for measuring complexity of reuse (see Figure 2). It is based around four inter-related dimensions: the delivery approach, activity design, technology use and ease of adaptation.

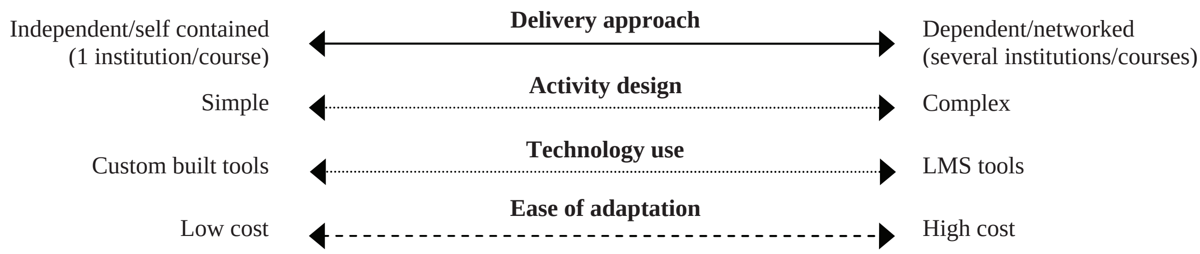

Figure 2: Dimensions of reuse

Clearly, there are still many issues that need addressing to enable greater uptake and reuse of learning designs. One way forward is to generate more discussion about the practicalities of reuse, using case studies such as the one presented in this paper (see also Fill et al., 2006), particularly as one of the main challenges remains how to shape the learning design to 'fit' the actual teaching context and its available infrastructure supports.

References

Brierley, G., Hillman, M., Devonshire, E. & Funnell, L. (2002a). *Description of Round Table Exercise: Environmental Decision-Making about Water Resources in Physical Geography.* Learning Designs Website: http://www.learningdesigns.uow.edu.au/exemplars/info/LD26/index.html. [viewed July 3, 2006].

Brierley, G., Hillman, M., & Devonshire, E. (2002b). Learning to Participate: Responding to Changes in Australian Land and Water Management Policy and Practice. *Australian Journal of Environmental Education*. 18: 7–13.

Conole, G. & Oliver, M. (2002). Embedding theory into Learning Technology Practice with Toolkits. *Journal of Interactive Media in Education.8:* 1–28. http://www-jime.open.ac.uk/2002/8 [viewed Oct 1, 2006].

Fill, K., Leung, S. DiBiase, D. & Nelson, A. (2006). Repurposing a learning activity on academic integrity: the experience of three universities. *Journal of Interactive Media in Education.* 01: 1–12. http://www-jime.open.ac.uk/2006/01 [viewed Oct 1, 2006].

Learning Designs website: http://www.learningdesigns.uow.edu.au/ [viewed July 3, 2006].

Oliver, R. (1999). Exploring strategies for online teaching. *Distance Education. 20:* 240–254.

Taylor, P., Lopez, L. & Quadrelli, C. (1996). *Flexibility, Technology and Academics Practices: Tantalising tales and muddy maps.* Canberra: AGPS.

van Ments, M. (1989). *The effective use of role play*. London: Kogan Page.

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Learner identities in transition: Getting to know our students better through a comparative investigation of two British and Australian postgraduate programs

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This paper describes research in progress, which aims to explore the ways in which learners in higher education negotiate issues of identity performance when making the transition between face-to-face learning and learning online. The research compares the talk of two groups of British and Australian learners engaged on courses in which an initial period of classroom-based learning is followed by collaborative, internet-based study.

Drawing on methodological tools provided by discourse analysis, the project is working with discussion-board transcripts generated in the context of online learning to formulate a methodology appropriate for analysing the 'frozen talk' of the online discussion. Insights from this analysis will be used to draw conclusions on how identities are 'written' within online courses, how this differs from identity construction in conventional learning contexts, and how differing institutional, cultural and pedagogical factors affect modes of identity construction among learners in such 'blended' learning environments.

Keywords: blended learning, identity, discourse analysis, online communication

Identity transitions

The growth in the cultural relevance of new digital technologies for communication, and the location of increasing amounts of social activity within cyberspace environments, continue to impact significantly on learners in higher education, and on the institutions within which they are embedded. Much research in the fields of cultural and cybercultural studies, technology studies and cultural theory has focused on the tendency of these spaces to allow an openness and relative fluidity in the way in which individuals 'write' their identities online (Turkle, 1996; Voithofer 2002; Zembylas & Vrasidas, 2005). By contrast, other recent work in this area makes reference to phenomenological approaches, which highlight the importance of embodiment and co-presence to the formation of human ways of knowing. In applying these ideas to online spaces, this literature tends to criticise much cyber-utopic thinking for its failure to properly consider the material constraints which affect our engagement with the digital domain and the ways in which we construct ourselves – or are constructed – within it (Whitley, 1997; Coyne, 1999; Hayles, 1999; Hardey, 2002).

While there is a growing literature applying these ideas to the cyberspace classroom (Dreyfus, 2001; Warschauer, 2002; Mann, 2003; Bayne, 2004; Dall'Alba & Barnacle, 2005), there has been relatively little study of the ways in which identities are negotiated in 'blended' learning contexts, in which online and embodied environments are both brought into play in the delivery of learning and teaching.

The objective of the research to be presented is to enrich the existing literature by conducting a comparative study of two online, postgraduate-level courses in contrasting institutions – the University of Edinburgh and the University of New South Wales. Both courses offer professional development in teaching and learning. These courses are particularly apt for a study of this type, not only in that the online medium used for teaching tends to foreground identity issues, but also in that they offer a context within which course participants – often experienced teachers – are themselves negotiating unfamiliar identities as advanced learners.

The project is funded by the British Academy under its Special Joint Programs scheme.

Spaces for study

We are looking at two, discrete learning ‘events’ – one course at Edinburgh and another at New South Wales. The University of Edinburgh course ‘An introduction to digital environments for learning’, constitutes the foundational element of a taught postgraduate program, the MSc in E-learning. The instance of this course which the project will investigate took place over twelve weeks, in which a single, intensive face-to-face summer school week was followed by further weeks of online, distance learning. Participants in this program were academic and support staff from higher and further education institutions across the UK. The course we will be looking at applies a critical approach to the new learning spaces enabled by internet technologies, conducting collaborative work and discursive exchange across a range of modes and media including weblogs, wikis, discussion boards and chat rooms.

The University of New South Wales course ‘Designing Short Courses and Workshops’, is an elective course in both the Master of Clinical Education and Master of Public Health programs. The course instance being explored for this project took place over eight weeks, in which a single face-to-face workshop run over three days was followed by further weeks of online, distance learning. The online environment is designed to enable participants to engage in collaborative tasks working towards a final plan for their own short course or workshop. Participants in the course were medical educators, working in health-related fields.

Considering frozen talk

The research to be presented explores the ways in which learners in these two study environments negotiated issues of identity performance when learning online. How, in such a context, do learners negotiate the shift from relatively familiar, embodied modes of identity construction experienced face-to-face to the textually-constructed and more mutable modes offered by the online environment? And how do these identity issues affect the project of learning and teaching? Our research analyses the online ‘talk’ of these two groups of learners, on programs which are comparable in terms of their content and mode of delivery, but which are each operating within different cultural and institutional contexts.

The study uses methods drawn from critical discourse analysis (Denzin, 1997; Hine, 2000; Fairclough, 2001; Wodak & Meyer, 2001; Fairclough, 2003) to examine the writing genres and modes of identity performance operating within these two courses. While these methodologies are well-established in research in conventional teaching contexts, their application to the study of online spaces is still relatively untried (important exceptions are (Warschauer, 1999; Gustafson, Hodgson et al. 2004)). For this reason, an important outcome of this research is the attempt to forge a methodology suitable to the study of interaction in digital learning spaces. In reporting on our methodology, we aim to contribute to the repertoire of approaches available to researchers in learning and social interaction in the digital domain.

Working within a view of identity as performance rather than essence (Butler, 1990), the method of discourse analysis we use draws on the work of Fairclough (2003) in exploring the range of semantic, discursive and generic domains learners operate within as they textually ‘perform’ identity within the online discussion group.

Research themes in progress

The methodology we use focuses primarily on two aspects of textual analysis drawn from Fairclough (2003). First, we look at how the semantic relations expressed in students’ postings work to legitimate their content. An early finding is that legitimation based on a narrative of *experience* (or what Fairclough after Van Leeuwen calls ‘mythopoesis’) tends often to be very much foregrounded within students’ postings. The narrative technique is striking in the way it appears to allow students – who are also experienced teachers in other contexts – to discursively position themselves in relation to an argument, while also enabling them to perform an authorising identity as either expert learner, or expert teacher.

This theme of the 'balancing' of learner and teacher identity is further explored through analysis of modality and the way this aspect of 'speech' can enable us to say something about the performance of identity through truth commitment, values and dialogicality in individual postings. Early findings indicate that the emergent discussion board 'genre' offers a novel space in which the interplay between formal academic discourse and 'playful' talk enables a form of interdiscursive 'hybridity' (Fairclough, 2003) which holds interesting promise and challenge for designers of online pedagogy. In such a space, students on the courses being studied were able skilfully to perform identities and roles which were synchronously those of expert and novice, teacher and learner, writer and speaker.

Various other compelling themes are emerging from our analysis. For example, in relation to 'intertextuality', how do our learners weave and position their own 'voices' around those of their peers, authorities and teachers, and how does the medium within which these exchanges take place constrain and enable this kind of dialogicality? What genre 'mix' defines what is particular to the pedagogical discussion board, and how can we draw on genre analysis to better enable our learners to work well within these spaces? And, in relation to our overall theme, in what ways can analysis of the features of talk described above help us to approach what is distinctive about the identities of learners online, and better enable us to practice and critique within the field of online learning?

References

Bayne, S. (2004). The embodiment of the online learner. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds.), *Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference* (pp. 105–115), Perth, Western Australia, 5-8 December.

Butler, J. (1990). *Gender Trouble*. New York, Routledge.

Coyne, R. (1999). *Technoromanticism: digital narrative, holism, and the romance of the real*. Cambridge, Mass., MIT Press.

Dall'Alba, G. & Barnacle, R. (2005). Embodied knowing in online environments. *Educational Philosophy and Theory*, 37(5), 719–744.

Denzin, N. K. (1997). *Interpretive ethnography: ethnographic practices for the 21st century*. Thousand Oaks, CA, Sage.

Dreyfus, H. L. (2001). *On the internet*. London, Routledge.

Fairclough, N. (2001). *Language and power*. Harlow, Longman.

Fairclough, N. (2003). *Analysing Discourse: Textual Analysis for Social Research*. London, Routledge.

Gustafson, J., Hodgson, V., Kehler, L., Mann, S., & Olsen, S. F. (2004). Towards a methodological approach for the analysis of issues of communication and control in networked e-learning discourse. In S. Banks, P. Goodyear, V. Hodgson, C. Jones, V. Lally, D. McConnell & C. Steeples (Eds.) *Proceedings. Networked Learning 2004* (pp. 258–265). Lancaster: Lancaster University.

Hardey, M. (2002). Life beyond the screen: embodiment and identity through the internet. *The Sociological Review*, 50(4), 570–585.

Hayles, N. K. (1999). *How we became posthuman: virtual bodies in cybernetics, literature and informatics*. Chicago, University of Chicago Press.

Hine, C. (2000). *Virtual ethnography*. London, Sage.

Mann, S. J. (2003). A personal inquiry into an experience of adult learning on-line. *Instructional Science* 31(1–2), 111–125.

Turkle, S. (1996). *Life on the screen: identity in the age of the internet*. London, Phoenix.

Voithofer, R. (2002). Nomadic Epistemologies and Performative Pedagogies in Online Education. *Educational Theory*, 52(4), 479–494.

Warschauer, M. (1999). *Electronic literacies: language, culture, and power in online education*. Mahwah, NJ, Lawrence Erlbaum Associates.

Warschauer, M. (2002). Languages.com: the internet and linguistic pluralism. In I. Snyder (Ed.) *Silicon literacies: communication, innovation, and education in the electronic age* (pp. 62–74). London, Routledge.

Whitley, E. (1997). In cyberspace all they see is your words: a review of the relationship between body, behavior and identity drawn from the sociology of knowledge. *OCLC Systems and Services*, 13(4), 152–163.

Wodak, R. & Meyer, M. (Eds.) (2001). *Methods of critical discourse analysis. Introducing qualitative methods.* London, Sage.

Zembylas, M. & Vrasidas, C. (2005). Levinas and the “inter-face”: The ethical challenge of online education. *Educational Theory*, 55(1), 61–78.

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Taking ownership of technology: Lecturers as LMS learners

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Our paper presents the findings from a study of personalised support in the use of the Learning Management System (LMS) to lecturers at the Faculty of Medical and Health Sciences, University of Auckland. Our study indicates that personalised support is an effective means of supporting some lecturers as they learn about the use of technology for teaching. We conclude our paper by considering the value of this research for the Faculty.

Keywords: technology, learning management system, training, pedagogy

Ownership and learning

When we consider the question "Whose technology?" we are essentially asking about ownership and with respect to the use of a LMS within a university ownership is a matter of "buy in" on the part of the lecturers who are expected to use the LMS. One way to encourage "buy in" is to demonstrate the usefulness of technology for education (Ahmed, 2003). For example, a LMS might be used to structure learning in terms of well established learning theories (Katz, 2003). The realisation of this ideal is, however, contingent on the ability of lecturers to use the LMS effectively. For many lecturers effective use will require technology use education.

Traditional staff development with technology

As part of an institutional strategy for the effective deployment and management of a LMS, the issue of educating staff in the use of technology is one amongst a host of issues (Ellsworth, 1997; Harrsch, 2000; Meehan, Obler, Schiorring, & Serban, 2002; Minshul, 2004; Roberts, Lawson, Newble, & Self, 2002). However, appropriate training remains vitally important to the successful adoption of technology (Meehan et al., 2002, p. 6). Traditional staff development in a tertiary education setting is often provided to lecturers in groups in a class-like setting following a predetermined format. This has been referred to as the "blunderbuss approach" (Minshul, 2004, p.12). Group education could be carried out more effectively if delivered around the principles of constructivist learning (Leh, 2005, pp. 36 & 38). As an alternative to constructivist group based teaching, our Faculty sought to provide individual assistance to lecturers to provide a flexible technology use education strategy for busy lecturers.

LMS at the University of Auckland

The Faculty central to this study is located on a separate campus. Staff development courses for the University LMS were provided at a location closer to the main University campus. As the lecturers in the Faculty have teaching, research and clinical responsibilities they are busy and the fact that the training sessions were provided only on the main campus was a barrier to participation. An attempt to offer lecturers development sessions on the Faculty campus was made but attendance was variable. There are two possible reasons for this: the lecturers with clinical and teaching responsibilities may not have been able to attend on the particular dates in question; the technology training was not targeted to meet the specific lecturers' needs. To support the lecturers' use of the University LMS a Learning Technology Assistant (LTA) was sought. Personalised help provided for a more flexible approach deemed likely to meet the needs of academic health professionals. Providing personalised technology use education is commensurate with the notion that "multiple opportunities for training and consulting" is an "enabling factor in the deployment and implementation of instructional technology" (Meehan et al., 2002, p. 6). A review of the irregular LTA service provided in 2005 resolved that for 2006 Faculty LTA support would be available every Thursday from 9AM and 3PM commencing three weeks before the start of semester. Lecturers could book LTA time and the LTA would go to their office. After the first semester the effectiveness of a Faculty LTA was questioned and this study was undertaken to audit the use of and effectiveness of the LTA service.

Method

Both quantitative and qualitative data from the LTA and lecturers from the School of Nursing were sought from the first semester 2006. The LTA provided data on the service including the number of lecturers seen and the average time of each visit. This was supplemented by a semi-structured interview which explored the LTA's experience and perception of the nature of the role and the response to the service. Themes were derived from the interview data.

Lecturers who utilised LTA assistance were asked to complete a questionnaire consisting of both open and closed questions. Lecturers were asked about their prior LMS training, others sources of LMS assistance and skill level with both computers in general, and the LMS. Self-rating questions asked lecturers to rate their overall computer and LMS skill on a five point scale using Benner's terms of Novice, Advanced Beginner, Competent, Proficient and Expert (Benner, 1984, pp.13–34).

To investigate the perceptions of the helpfulness of LTA assistance, lecturers were provided with statements and asked to rate these on a four point Likert scale: not helpful; sometimes helpful; helpful; and most helpful (Not applicable was also an option). Space was available for comments. A small number of lecturers who had not used the LTA completed an amended version of the questionnaire with an added question inquiring why they had not sought LTA assistance.

Findings

The LTA reported 33 individual appointments with 24 different lecturers over 13 available days. February, the month before semester started was the busiest, and thereafter it was progressively quieter. Two sets of data are presented: from lecturers who used the LTA service and data from an interview with the LTA. Data from a smaller sample of non-users is not presented in this paper. A total of eight out of a possible 20 (40%) questionnaires were returned from users of the LTA service (four lecturers were on conference leave and the end of term is a busy time for lecturers with exam marking taking precedence).

Lecturers who used the LTA service

Lecturers who used the LTA service were asked their reasons for seeking assistance. Novices were seeking an orientation or introduction to the LMS to get them started (n=3), while those with more experience sought assistance with specific advanced functions (n=5). Of the eight lecturers who returned completed questionnaires two had attended LMS training of less than two hours duration prior to using the LTA service. The LMS training was considered "not helpful" by one educator and "helpful" by the other educator, with the additional comment of "I need to be able to apply learning to practice" and "I prefer doing … rather than watching". Lecturers were also asked to rate their overall computer and LMS skills and in general they rated their computer skills more highly than their skills with the LMS (Table 1).

Table 1: Users self-rated overall computer and LMS skills

***n*=8**	**Computer**	**LMS**
Novice	0	2
Advanced beginner	3	5
Competent	3	1
Proficient	1	0
Expert	1	0

Prior to having LTA assistance, LMS help was obtained from the Phone Help (n=3), On-line Help (n=1), and six lecturers indicated that they asked their peers (n=6) for assistance. The help accessed was considered either "helpful" (n=1) or "most helpful" (n=3).

LTA assistance had been used mostly once or twice (n=6); and one lecturer used the service three or four times; another lecturer used the service more than four times. The time spent with the LTA was mostly 30 minutes (n=4), with some needing longer sessions of an hour (n=2), or longer 1½–2 hours (n=1). Lecturers were asked to rate the LTA help received, and while one lecturer found it "unhelpful", more found it "helpful" (n=3) or "most helpful" (n=4). Comments included "I could never have got the assessments on [the LMS] without one-to-one assistance". When asked if they would recommend LTA help to others most answered yes (n=6).

Additional comments from lecturers were varied. One new staff member with experience of another LMS found the University LMS "primitive" and complained "It's putting me back about 10 years!" A novice LMS user stated, "At this stage I'm not required to do much, but I will need further assistance later", and "The LMS is complicated. There's a lot to know and learn". This was reiterated by another novice LMS user who described the LMS as "not user friendly". However a competent user who had used an earlier version of the LMS reported, "I have bonded with the new version of the LMS and feeling very happy with myself and this new found relationship – thanks!"

LTA perspective

The analysis of the interview with the LTA revealed four key themes: LMS issues and the impact on teaching; lecturers' responses towards individualised assistance; peripheral learning and increasing IT skills; challenges of being a LTA. We provide a limited number of the LTA responses within the four themes.

LMS issues and the impact on teaching
Computer and LMS skill and teaching experience impacted on the LTA's approach; "I explain the LMS differently to old or new lecturers (those new to the university)". For novices the LTA was "a salesperson", while for proficient or expert users the LTA was "just an instructor", as these lecturers asked for specific assistance. Novice and advanced beginners were felt to be "more interested in course design aspects". A new iteration of the LMS resulted in the LTA "getting more questions about course creation and design and less technical questions with the new LMS version" from less experienced users.

Lecturers' response towards individualised assistance
Individual LMS education was effective for some, but not all lecturers. "Some lecturers are negative, some positive. Some of that difference could be a personality thing". The negative reactions were considered to relate to the LMS not meeting the lecturers' expectations. Another explanation for lecturers' resistance was, "Some resistance comes from lecturers who are technophobes, they hate computers, and they probably hate the LMS and feeling they have to, or are required to use it. Resistance might be related to not knowing or their inability with general IT skills, not necessarily just with the LMS". However, when the experience was positive the LTA described the lecturers as having "a huge sense of achievement".

Peripheral learning and increasing IT skills
The LTA explained how LMS help often involved peripheral IT skills; "Some lecturers can't find their files, don't know where they filed them, and some don't recognise file types, .pdf for example. Another issue is document versions and getting the wrong version, and even little hints, like using cut and paste speed keys. I think I give lecturers lots of tips about using their computer better". The LTA recognised that these lecturers did not "recognise the difference between other IT skills and LMS use".

Challenges of being a LTA
Success related to a number of factors coming together effectively; "The LMS, the Internet and the lecturers' computer and files all have to be ready. Repeat visits relate directly to that success rate and the interaction. If the session has been less than 100% but really positive I am asked back again, but if anything didn't work well, no matter how positive, then I never hear from them again". The final

comment from the LTA relates to pedagogy when she stated, “Really we need a bridge between course design and LMS use”.

Conclusions

Our work has been beneficial in a number of ways. Through submitting a report to the University LMS team and through discussing the provision of the LTA service, we raised awareness concerning the fact that there are lecturers who benefit from personalised and flexible training opportunities and we will request for the service to be continued. Our own work is commensurate with the University policy to provide increased technology use education for teaching staff and through being proactive we have contributed to this initiative. The literature review and the data from the research has provided the basis for the Faculty’s Learning Technology Unit to assess its strategy for providing technology use education to lecturers in order to develop a sustainable approach to the adoption and use of technology within the Faculty. In particular, the Learning Technology Unit will be considering lecturers in terms of: their preparedness for working with technology; their levels of computer literacy; and their course design with respect to use of the LMS. Finally, our research has provided the basis for more sustained research within the Faculty on technology use education, particularly in terms of enabling lecturers to develop and manage their own e-learning solutions.

References

Ahmed, A. (2003). Faculty adoption of technology: Training comes first. *Educational Technology, March/April*, 51–53.

Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice*. Menlo Park, CA: Addison-Wesley.

Ellsworth, J. B. (1997). *Technology and change for the information age*. Retrieved June 9th, 2006, from http://technologysource.org/article/technology_and_change_for_the_information_age/

Harrsch, M. (2000). *Luring faculty to technology's field of dreams*. Retrieved 9th June, 2006, from http://technologysource.org/article/luring_faculty_to_technologys_field_of_dreams/

Katz, R. N. (2003). Balancing technology and tradition. The example of course management systems. *Educause Review, July/August*, 48–59.

Leh, A. (2005). Lessons learned from service learning and reverse mentoring in faculty development: A case study in technology training. *Journal of Technology and Teacher Education, 13*(1), 25–41.

Meehan, K., Obler, S., Schiorring, E. B., & Serban, A. M. (2002). *Project overview overall summary and recommendations: @ONE Technology Training Project Study*: RP Group of California Community Colleges, Santa Ana.

Minshul, G. (2004). *VLEs: Beyond the fringe and into the mainstream. Guidance on the mainstreaming of virtual environments, Drawn from the Proceedings of the 2004 Online Conference from Becta's Ferl Service*. UK: British Educational, Communications and Technology Agency.

Roberts, C., Lawson, M., Newble, D., & Self, A. (2002). *Towards a managed learning environment in medical education: Sheffield's story*. Sheffield: University of Sheffield.

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Using educational technologies to understand how learners solve problems

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In this paper we examine how a highly interactive educational technology program *Child Growth & Development in the first 12 months of life* was used to investigate the problem solving behaviour of learners. This preliminary study was also used to evaluate the study instruments ahead of a more substantial investigation. The design of the program was informed by Problem Based Learning (PBL) philosophy with authentic problems as the stimulus for problem solving activities. We describe how an electronic record of learners' movements and activities was captured by an embedded audit trail system, as learners progressed through the steps of a problem solving procedure. This method revealed highly individual problem solving behaviours for learners. Similarities and differences were shared between learners at different stages of the process. External measures, including learner perceptions of problem solving ability, were used to supplement the audit trail data. This enabled a more detailed picture to emerge of the factors that may influence problem solving skills, including confidence, approach-avoidance style and self-control.

Keywords: problem solving, problem based learning (PBL), educational technologies, audit trails

Introduction

One of the themes the committee has encouraged authors to consider this year is *Who's Learning – how well do we know our students?* The theme itself conjures up more questions – do we know how our students use educational technologies? Do they use them in the way that designers and developers envisaged? We design educational technologies with the best intentions of providing students with enhanced learning opportunities, but do the students see it that way? Does the use of a theoretically based design necessarily guarantee its effectiveness as a learning tool? Do we concentrate on getting the theory right, but overlook personal characteristics such as confidence and motivation?

In this paper, these questions are explored within the context of problem solving, a skill highly valued by educators and future employers, but often elusive to graduates. Problem solving is arguably the most important cognitive activity for young people in everyday and professional contexts (Jonassen, 2000). In Australia, it has been listed as one of the employment related key competencies in compulsory education and training, and is included in a set of generic skills compiled by the Australian Council for Educational Research (ACER) for graduate skills assessment (Oliver & Towers, 2000). However, it is a complex process that is poorly understood.

It is acknowledged that problem solving is a highly variable process, determined by the nature of the problem, the way the problem is represented and individual differences in problem solvers (Jonassen, 1999). Jonassen (2000) points out that problems differ in complexity or the number of elements (variables, functions or issues) they contain and the relationship between elements. Some problems are embedded within a context, while others are abstract. Problems also differ in terms of their structuredness. Well-structured problems (known as text book problems) are well defined – all elements are presented to the problem solver, the goal is known and a limited number of rules and principles apply. On the other hand, ill-structured problems are not well defined – all elements are not initially known and additional elements may only become apparent after further investigation. Indeed, the revelation of extra information may change the nature of the problem. Moreover, ill-structured problems have no clear goals, they often require integration of several content domains to solve and multiple solutions may apply. Most problems encountered in everyday life are ill-structured.
Problems can also be presented to and perceived by solvers in different ways, therefore, the personal representations that solvers construct are highly individual and can be influenced by the context and fidelity of a problem (Jonassen, 2000). Many individual differences have been identified amongst

problem solvers, including familiarity with problem type, level of domain knowledge, cognitive style, metacognition, underlying beliefs about the nature of problem solving, attitudes and beliefs about one's ability to solve the problem (self-confidence), motivation and general problem solving skills (Jonassen, 2000).

Jonassen (1997) argues that the teaching of problem solving in formal education has received little attention. This may in part be due to the ongoing debate about whether generic or context-independent problem solving skills can be learnt and applied to different contexts. It may also be because the problem solving process itself is not well understood. Nevertheless, Jonassen's (1997) belief that learners need more experience at solving complex, ill-structured problems embedded in context, is noteworthy. One teaching strategy that purports to teach problem solving skills is Problem Based Learning (PBL).

Educational technology programs that use a PBL design, with real-life problems as the stimulus for problem solving activities, provide a valuable tool to investigate the problem solving behaviour of learners. The authors have previously used a PBL designed program, *Child Growth & Development in the first 12 months of life* embedded with an audit trail system, to identify two different behaviours of learners searching for resources to assist them with their problem solving activities (Elliott, *et al*., 2005). "Specific" learners used a quick, targeted approach, while "general" learners used a systematic approach, taking up to 50% longer to complete their research. By supplementing the audit trail data with external measures, a correlation was identified between the type of behaviour students displayed and their understanding of the problem. Specific learners exhibited a greater understanding of the problem than general learners.

The earlier study focussed on the search behaviour of learners. In this paper we describe how similar methods were used in this preliminary study designed to investigate the behaviour of learners throughout the entire problem solving process, from the initial problem analysis through to implementing a solution. The study also allowed us to evaluate the use of the Problem Solving Inventory (Heppner, 1988) to enable a more detailed picture to emerge of the different behaviours learners exhibit while solving problems.

Theoretical insights into PBL and problem solving

Problem Based Learning (PBL) is a widely used curricular reform. It was first developed at McMaster University in medical education in the 1960s, but is now pervasive in architecture, biochemistry, business administration, dentistry, economics, engineering, geology, law, nursing, optometry, social work and veterinary education. In its ideal form authentic problems are used as a context for small groups of students to acquire factual knowledge, to learn generic processes such as problem solving and evidence-based enquiry skills, and to develop self-directed or life long learning strategies (Albanese & Mitchell, 1993; Norman & Schmidt, 1992). In medical education, PBL also enables basic sciences to be integrated with clinical knowledge, and promotes the development of clinical reasoning strategies (Norman & Schmidt, 1992).

Many variations of PBL are practiced at different institutions, prompting Barrows (1986) to devise a taxonomy of PBL methods. However, as a general rule the PBL procedure involves the following stages: Identification of problem elements, Formulation of hypothesis(es), Identification of learning needs, Individual study/search, Evaluation of understanding and Development of solution(s). It is important to note here that PBL should not be confused with problem solving learning where learning activities are centred on problems. Authentic PBL strictly follows the structures and procedures first classified by Barrows (1986).

PBL focuses on the process of learning. It recognises learning as an integrated process of cognition, metacognition and personal development (De Grave *et al*., 1996). Cognitive science research provides explanations for the learning mechanism of PBL (Norman & Schmidt, 1992; Schmidt, 1993a). The problem analysis stage of the PBL procedure (e.g. identification of problem elements, hypothesis formulation and identification of learning needs) is thought to serve four main purposes: activation of learner's prior knowledge, elaboration of knowledge, placing knowledge in context and, engaging learners and stimulating their curiosity (Schmidt, 1993b). During problem analysis existing knowledge is questioned and evaluated. A mismatch between an individual's existing state of knowledge and the details of the problem they are working on creates cognitive conflict, which in turn leads to a conceptual change in the learner's knowledge.

Although cognitive science theories predict that students in PBL curricula should be better at problem solving than those in traditional courses, reported outcomes show mixed results (Albanese & Mitchell, 1993). Evensen and Hmelo (2000) suggest this is because in the past, traditional academic measures based largely on declarative knowledge, were used to assess outcomes. More recently, studies have shown that PBL students are able to transfer their problem strategies to new problems and to create more coherent solutions than traditional students (Evensen & Hmelo, 2000).

Although the development of PBL has been informed by cognitive science theories, reflections by Barrows (2000) on starting up the PBL medical course at McMaster University, tend to indicate that the curriculum change was driven by pragmatic reasons rather than developments in cognitive science at that time:

> They [the committee] decided that from the beginning, learning would occur around a series of biomedical problems presented in small groups with the faculty, functioning as "tutors or guides to learning". No background in educational psychology or cognitive science guided them, just the expressed hope that students would be simulated by the experience, would see the relevance of what they were learning to their future responsibilities, would maintain a high level of motivation for learning, and would begin to understand the importance of responsible professional attitudes (Barrows, 2000, p. vii)

However, references to aspects of PBL can be found in the writings of educational theorists of the era, such as Gagne (1966). Additionally, Schmidt (1965) described the problem solving ability of a PBL group, compared with a group who had been taught to memorise how to solve one problem and to another group given only the principles on which the initial set of problems were based. The groups were given increasingly difficult problems to solve. The first group were able to solve problems based on progressively more complex principles whereas the others were not able to go beyond the initial context.

In fact, comparisons between PBL problem solving procedures and models of problem solving processes reveal many similarities. Gick's (1986) information processing model of the problem solving process describes the construction of a problem representation, the search for (or generation of) possible solutions, and the implementation and monitoring of solutions. To develop a problem representation, the learner identifies attributes of the problem and maps the problem onto prior knowledge, thereby building a personal interpretation of the problem. It is through this process of schema activation (linking the problem to existing knowledge) that learners attempt to find a schema for solving that type of problem (Gick, 1986). Resnick and Glaser (1976) relate these processes to memory, indicating that the problem representation is developed in working memory and then the learner searches through long term memory for a "stored" solution. If a solution can't be retrieved then the learner may restructure or redefine the problem.

Gick's (1986) model incorporated several previously published models of problem solving (Newell & Simon, 1972; Bransford & Stein, 1984), but is often regarded as a simplified version of events. Nevertheless, the objectives of the problem representation according to Gick's (1986) model directly relate to the problem analysis stage of the PBL procedure when the problem is clarified, prior knowledge is activated and individual learning needs are identified. In both cases this is followed by a search phase and then implementation of a solution. These similarities indicate the validity of using educational technology programs with a PBL design to investigate the problem solving behaviour of learners.

The *Child Growth & Development* program

The *Child Growth & Development in the first 12 months of life* program is a highly interactive educational technology program developed to facilitate the learning and teaching of child growth and development to medical students studying paediatrics. The design of the program and the reasons behind the development has been previously described (Elliott, *et al*, 2003). In brief, the program is structured around problems that a family encounter as their newborn son grows and develops over the first year of life. Students work through each problem to arrive at a solution, which they present to the family in the form of advice. The problem used for the current study arises when the infant is two weeks old and relates to the mother's anxiety about breast-feeding and the baby's unsettled behaviour.

The design of the program was informed by PBL philosophy and a critical evaluation of the program showed that it aligned well with the original structures and procedures of Barrows (1986) (Elliott, *et al*, 2003). A common PBL problem solving procedure was used, which consisted of: Identification of problem elements, Formulation of hypothesis(es), Identification of learning needs, Individual study and search for information, Evaluation of understanding and Development of solution(s). Details of each phase and the instructions given to learners are shown in Table 1. To guide students through the entire problem solving process, it was broken down into a series of seven sub tasks. Tasks 1, 2, 3 & 4, for example, comprised the problem analysis phase of the problem solving process. Task 5 was part of the study/search phase, as were tasks 2 and 7 because students were encouraged to search the resources for additional information before submitting their responses. Model expert answers were given as immediate feedback after students submitted their responses to each task.

Table 1: Problem solving procedure used in the *Child Growth & Development* program

Task	**Instructions**
1 Identify problem elements (from vignette)	• Play the video and listen to Louise's [the mother's] comments. • Enter any parental concerns you identify into the notebook and submit.
Feedback 1	Expert feedback
2 Formulate hypothesis(es) Study/search	• What possible hypotheses might explain the situation between Jack [the baby] and Louise (e.g. what factors could be causing, contributing to, or influencing the parental concerns)? • Enter your hypothesis/es into the notebook and then submit. • You may wish to consider additional information to help you formulate your hypothesis/es. If so, investigate the Resources…
Feedback 2	Expert feedback
3 Identify learning needs	• What additional questions would you like to ask Louise? • Enter these in point form into the notebook and then submit.
Feedback 3	Expert feedback
4 Identify learning needs	• What information do you require from a physical examination? • Enter these in point form into the notebook and then submit.
Feedback 4	Expert feedback
5 Study/search	Plot Jack's growth on his centile chart.
Feedback 5	Expert feedback
6 Evaluate understanding	• Use the additional information you have gathered to formulate your understanding of the problem. • Enter your formulation into the notebook and then submit.
Feedback 6	Expert feedback
7 Develop solution(s) Study/search	• What advice would you give Louise regarding her concerns about two week old Jack? • Outline your advice in the notebook and then submit. • You may want to revisit the Resources…
Feedback 7	Expert feedback

The problem solving tasks were supported by a rich variety of resources, which students could access at any stage via drop down menus. Five items contained in the resources related specifically to the problem used for the current study. They were: Feeding, Behavioural states, Measuring Growth, Motor Development and Communication (in descending order of importance). There were also nine resources that provided more general material about newborn infants.

Method

Approval to carry out this study was obtained from the Human Research Ethics Committee, The University of Melbourne. Participants were informed of the study methods and gave their consent to participate.

Sample

A convenience sample was used in this investigation as it was regarded as a preliminary study to a more expanded investigation with health science students. The sample consisted of four participants (casual staff employed by the Faculty IT unit or the Medical Education Unit, e.g. part-time research assistants). Participants were chosen because of their similar backgrounds; for example, they were all young adults with a tertiary qualification, were not parents, did not have a medical background and had no specific training in PBL. Previous evaluation of the *Child Growth & Development* program suggested that prior knowledge of the PBL process may influence the way learners interact with the program (Elliott, *et al*, 2003), so for this study it was important that participants had uniform knowledge of PBL (in this case no experience). While *Child Growth & Development* was originally developed for medical students studying paediatrics, the content is of universal interest, and because none of the participants had children of their own, it was assumed that they had similar levels of prior knowledge about the content area. Therefore, within the context of the study, participants were viewed as actual learners, albeit novice ones. Before beginning the program, participants completed the Problem Solving Inventory (Heppner, 1988) (see *Measures*). They were then briefly introduced to the program and allowed to work through the program unsupervised and at their own pace. An audit trail of each participant's activities was saved when they exited the program. After completing the program, participants were asked to respond to two open-ended questions.

Measures

Problem Solving Inventory (PSI)
The PSI (Heppner, 1988) is an instrument used to rate an individual's perception of their problem solving behaviours and attitudes. It assesses three factors: Problem Solving Confidence (a belief in one's own ability to solve problems), Problem Approach-Avoidance Style (a predisposition to engage, or not, in problem solving activities) and Personal Control (a measure of the extent an individual believes they are in control of their emotions and behaviours). All three factors are summed to give a Total Index. Low scores for each factor or the total index represent a positive perception of problem solving abilities. The PSI has been used extensively by McMaster University to evaluate Problem Based Learning programmes (Woods, 1994).

Audit trail
A customised version of *Child Growth & Development* was used for this study, consisting of one problem. While the general functionality of the customised and standard version were very similar, navigational controls in the former were modified so as to restrict access by users to those sections of the program directly relevant to the study. An audit trail system was embedded in the program and configured to create comprehensive records of which components of the program were accessed, in what order, and for how long, as well as users' textual responses to key tasks (Judd & Kennedy 2001). Captured records were stored in a convenient and readable xml format for later analysis.

The four sets of audit trail data were analysed by comparing each set to a model problem solving process (see Table 1). The model related the tasks carried out by learners in the program, to specific phases of the process (e.g. Identification of problem elements, Hypothesis formulation, Identification of learning needs, Study/search, Evaluation of findings and Solution). Therefore, time spent, resources visited, feedback accessed, order in which resources and feedback were visited and the frequency of visits to resources and feedback were determined for each phase of the problem solving process. Comparisons of these overall patterns of use were made to identify any differences or similarities in the process. It was assumed that the time recorded by the audit trail system was spent by the learner on task and not on other activities.

At each task (1–7), students were asked to enter their responses as free text. These text responses were captured by the audit trail system and were compared to ideal expert answers to determine the percentage of expert content they contained. This provided a clearer picture of learners' understanding as they progressed through the problem. Learners' solutions were more difficult to score because there was no single, correct solution, therefore, they were given a rating of poor, average or good, depending on their content. Learners' behaviour during the Study/Search stage was classified as "specific" if they targeted problem-specific resources first or "general" if they used a systematic approach to searching.

Reflective questions
To verify any behavioural patterns emerging from the audit trial data against external measures, participants were asked to respond to the following open-ended questions directly after completing the program:

1 What was the problem that you had to solve in the *Child Growth & Development* program?
2 Describe how you went about solving the problem (try and recreate the steps you took to solve it).

Responses to Question 1 were given a score out of 10 according to whether the problem was stated specifically (5.0 marks) or in general terms (2.5), and whether the following criteria were stated; problem indicators (1.0), other causes (1.0 each), implications (1.0 each), outcomes (0.5) and associated factors (0.5).

Responses to Question 2 were compared to an eight-step ideal problem solving sequence, where Step 1 = Clarification, Step 2 = Hypothesis formulation, Step 3 = Identification of learning needs, Step 4 = Enquiry driven search of resources, Step 5 = Hypothesis testing, Step 6 = Review, Step 7 = Hypothesis revision and Step 8 = Solution. Learner and ideal steps are represented on the X and Y axes, respectively, of Figure 1.

Results

Problem solving profiles for each learner were constructed from three measures (PSI, audit trail and the first reflective question) and are presented in Table 2.

Learner responses to the second reflective question "Describe how you went about solving the problem (try and recreate the steps you took to solve it)?" are graphically represented in Figure 1. The self-reported problem solving sequence of each learner and the degree of deviation from an ideal sequence are shown.

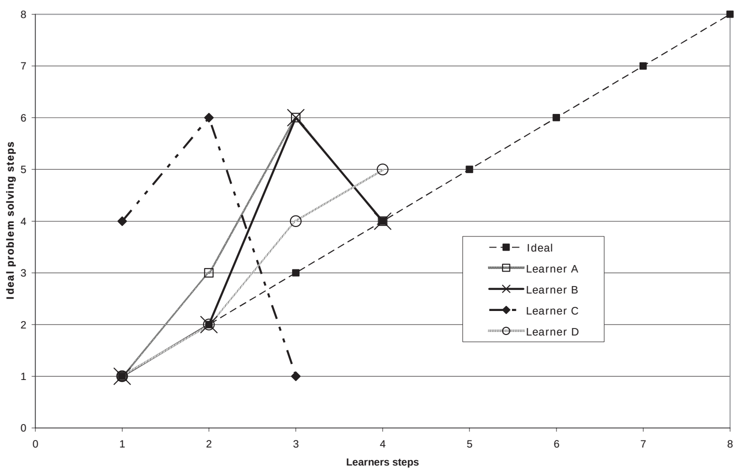

Figure 1: Learner's self reported problem solving steps compared to an ideal sequence

Table 2: Problem solving profiles of learners constructed from different measures (PSI, audit trail and the first reflective question)

	Learner			
	A	**B**	**C**	**D**
GENDER	Female	Female	Male	Female
PROBLEM SOLVING INVENTORY (PSI)				
Confidence	24.0	21.0	25.0	52.0
Approach - Avoidance Style	48.0	38.0	54.0	71.0
Personal Control	13.0	12.0	16.0	24.0
Total Index	85.0	71.0	95.0	147.0
AUDIT TRAIL				
Identify problem elements (Task 1)[1]				
Time spent on task	1.5 min	3.3 min	3.0 min	2.4 min
Elements identified[2]	75 %	75 %	50 %	50 %
No. of times vignette was played	2	6	5	3
Formulate hypotheses (Task 2)[1]				
Time spent on task	3.8 min	30.3 min	25.8 min	30.7 min
Hypotheses identified[2]	36 %	21 %	21 %	14 %
Most frequently visited resource (during this task)	Feeding	Feeding	Feeding	All resources equal
No. of visits to this resource	4	3	3	1
Identify learning needs (Tasks 3&4)[1]				
Time spent on tasks	2.5 min	3.3 min	3.9 min	3.4 min
Learning needs identified[2]	32%	36%	14%	11%
Most frequently visited resource (during tasks)	Expert feedback	None visited	Fathers	None visited
No. of visits to resource	3	-	1	-
Study/search (Tasks 2, 5, 7)				
Time spent on resources	3 min	26.2 min	26.1 min	28 min
Search pattern	Specific	Mixed (predominantly specific)	Mixed	General
Evaluate understanding (Task 6)				
Time spent on task	0.6 min	1.5 min	1.0 min	0.7 min
Problem formulation[2]	No response	No response	33%	67%
Develop solution (Task 7)				
Time spent on task	1.4 min	4.7 min	2.5 min	3.9 min
Solution rating[3]	Average	Good	Poor	Poor
REFLECTIVE QUESTION				
Problem score[4]	7.5	3.0	3.0	2.5

1 Tasks 1, 2, 3 & 4 make up the problem analysis phase of the problem solving process.
2 For these tasks, free text responses entered by learners were compared to an ideal expert answer to determine the percentage of expert content they contained.
3 Solutions entered by learners as free text responses were given a rating of poor, average or good, depending on content.
4 Learner responses to the first question "What was the problem that you had to solve in the *Child Growth & Development* program?" were given a score out of 10.

Discussion

Problem solving profiles showed that learners A and B performed the best problem analysis (e.g. Tasks 1, 2, 3 & 4) but achieved this outcome differently in terms of time spent on tasks, support material accessed and information identified. Learner A, for example, spent the least time on all tasks. Her study was highly specific, and during the hypotheses formulation phase she only accessed *Feeding*, the most important resource, switching back and forth from the task screen to the resource a total of four times before submitting her response. She did not visit any other resources, although she had viewed all four menus prior to going to the *Feeding* resource, presumably looking at their content.

On the other hand, learner B visited all fourteen available resources (both specific to the problem and more general). She spent the first five minutes of her search systematically accessing the resources in the order they appeared on the menus. However, having located *Feeding*, her study became highly specific as she targeted *Feeding* twice more. To identify learning needs, learner A appeared to rely on the expert feedback about hypotheses, accessing it three times in total. She also visited the *Feeding* resource again during this phase. Learner B, however, did not access any support materials while identifying learning needs, but her response contained more additional information required to solve the problem, that any other learner.

Whilst in the program, learners A and B developed average or better solutions to the problem. However, this result didn't necessarily translate into a good score when the question "What was the problem that you had to solve in the *Child Growth & Development* program?" was asked after completing the program: learner A obtained the highest score of 7.0 while learner B scored 3.0. When asked to describe how they went about solving the problem, learners A and B described similar steps (see Figure 1).

In contrast to the profiles of A and B, learner C performed poorly in the problem analysis phase, identifying fewer elements, fewer learning needs and formulating fewer hypotheses. His study/search pattern was unpredictable. At times he visited resources in the order they appeared on menus, at other times he visited resources randomly. Although he did not find the *Feeding* resource until late in his search, when he did find it his study became specific and he accessed the resource three times. The solution to the problem that learner C submitted whilst in the program was poor, and he also obtained a low score (3.0) when asked to define the problem after completing the program. The self-reported steps he took to solve the problem suggest that he began his individual study before clarifying what the problem was and what he needed to know to solve it.

Similarly, learner D also performed poorly at the problem analysis phase of the problem solving process. She identified fewer problem elements, hypotheses and learning needs than any of the other learners and her responses suggested that she did not have a good grasp of what she needed to know to solve the problem. During the hypotheses formulation phase, learner D carried out a systematic search of all fourteen resources in the order they appeared on the program menus. The search was thorough, taking approx 28 mins to complete, with an average of 2 mins being spent on each resource (ranging from 0.6 to 9.5 mins). This systematic searching of all resources suggests an inability (or unwillingness) to make judgements about which material would be more helpful to solving the problem.

Flavell (1976) postulated that the "deliberate, systematic search for whatever problem-relevant information happens to be available for retrieval" (p232) is an adaptive strategy in children unable to solve problems for which they have appropriate solution procedures. It is interesting to note that Learner D formulated a good understanding of the problem whilst in the program, but was unable to translate this into a good solution, or a high score for the reflective question. Moreover, her self-reported problem solving steps most closely resembled the ideal problem solving process than any other learner (see Figure 1). It appears that she knew the appropriate information and an effective problem solving process but was unable to bring them together to actually resolve the problem.

When the problem solving profiles of learners are viewed in light of the PSI scores, it is interesting that the low scores obtained by learners A and B for each problem solving factor (Confidence, Approach-Avoidance Style and Personal Control) and the Total Index indicated that they held positive perceptions of their problem solving abilities. Scores obtained by learner C for Confidence and Personal Control were similar to means from a sample of normal male adults (e.g. 21.8 for Confidence and 14.9 for Personal

Control (Heppner, 1988). However, the high score obtained by Learner C for Approach-Avoidance Style is indicative of a perceived tendency to avoid problem solving activities. This may explain why he began his individual study before clarifying what the problem was, preferring to delve straight into the resources rather than analyse the problem and work out what he needed to look for. The high scores obtained by learner D for all three factors and the Total Index, indicate a negative perception of problem solving ability. Could her negative perception of problem solving ability have prevented her from successfully completing and solving the problem?

Conclusion and future directions

This study has highlighted the role that educational technology programs such as *Child Growth & Developmen*t, which use a PBL design with real-life problems as the stimulus for problem solving activities, can play in investigating the problem solving behaviour of learners. The study revealed highly individual problem solving behaviours for different learners. Similarities and differences were apparent between learners for different phases of the problem solving process.

The use of the PSI to determine learner perceptions of problem solving abilities and to relate them to behaviour has raised an interesting research question. Can a learner's negative perception of their problem solving abilities prevent them from successfully completing and solving problems? Jonassen, (2000) notes:

> If problem-solvers do not believe in their ability to solve problems, they will most likely not exert sufficient cognitive effort and therefore will not succeed (Jonassen, 2000 p.71).

However, it should also be pointed out that the study participants were considered novices in the field and therefore, would be expected to experience some difficulty with the subject matter.

Further research is needed to answer the question about the effect of perception of problem solving abilities on problem solving outcomes. We are currently in the process of repeating this study with a cohort of 26 post-graduate nurses studying paediatrics at The University of Melbourne and a cohort of 60 graduate nurses from The Royal Children's Hospital, Melbourne. These cohorts are specialising in child health and have a particular interest in the content of the *Child Growth & Development* program. We aim to determine if similar problem solving behaviours emerge to the ones identified in this study, and if they relate to learner perceptions of problem solving abilities, including confidence, approach-avoidance style and control.

In conclusion, education programs based on solid theoretical learning and teaching models are a valuable means of determining how students learn with educational technologies. In this particular case, audit trail data has given us insights into the variety of ways learners approach problem solving. In addition, the use of external measures has allowed us to identify possible intrinsic factors that may influence the behaviour of problem solvers. These methods serve as an example of how we can "get to know our students better", and in so doing, be in a better position to provide them with meaningful learning experiences.

References

Albanese, M. A., & Mitchell, S. (1993). Problem-based learning: A review of literature on its outcomes and implementation issues. *Academic Medicine*, 68(1), 52–81.

Barrows, H. S. (1986). A taxonomy of Problem-based learning methods. *Medical Education*, 20 (6), 481–486.

Barrows, H. S. (2000). In D. Evensen & C. Hmelo (Eds), *Problem-based Learning A research perspective on learning interactions* Mahwah, NJ: Lawrence Erlbaum Associates (pp. vii–ix).

Bransford, J., & Stein, B. C. (1984). *The IDEAL problem solver: A guide for improving thinking, learning and creativity*. New York: W. H. Freeman.

De Grave, W. S., Boshuizen, H. P. A., & Schmidt, H. G. (1996). Problem based learning: Cognitive and metacognitive processes during problem analysis. *Instructional Science* 24, 321–341.

Elliott, K. A., Efron, D., Wright, M., & Martinelli, A. (2003). Educational technologies that integrate problem based learning principles: Do these resources enhance student learning? In G. Crisp, D. Thiele, I. Scholten, S. Barker, J. Baron (Eds), *Interact, Integrate, Impact: Proceedings of the 20th*

Annual Conference of the Australian Society for Computers in Learning in Tertiary Education (pp. 170–177). Adelaide, 7–10 December 2003.

Elliott, K. A., Judd, T. S., & Kennedy, G. E., (2005). Usage patterns: Highlighting differences in problem solvers. In H. Goss (Ed), *Balance, fidelity, mobility: Maintaining the momentum? Proceedings of the 22nd Annual Conference of the Australian Society for Computers in Learning in Tertiary Education* (pp. 187–195). Brisbane: Teaching and Learning Support Services, Queensland University of Technology.

Evensen, D. H., & Hmelo, C. H. (2000), *Problem-based Learning A research perspective on learning interactions* Mahwah, NJ: Lawrence Erlbaum Associates

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed), *The nature of intelligence* (pp. 231–235). New York: Lawrence Erlbaum Associates

Gagne, R. M. (1966). *The conditions of learning* (1st ed.). New York: Holt, Rinehart and Winston

Gick, M. L. (1986). Problem solving strategies. *Educational Psychologist*, 21, 99–120.

Heppner, P, P. 1988. The Problem Solving Inventory Manual, California: CPP Inc.

Jonassen, D. H. (1997). Instructional design models for well-structured and ill-structured problem solving learning outcomes. *Education Technology Research and Development*, 45(1), 65–94.

Jonassen, D. H. (1999). Towards a Meta-theory of Problem Solving.
http://tiger.coe.missouri.edu/%7Ejonassen/problems.htm [viewed 25 Jul 2006]

Jonassen, D. H. (2000). Towards a design theory of problem solving. *Education Technology Research and Development*, 48(4), 63–85.

Judd, T., & Kennedy, G. (2001). Extending the role of audit trails: A modular approach. *Journal of Educational Multimedia and Hypermedia,* 10(4), 377–395.

Newell, A., & Simon, H. (1972). *Human problem solving*. Englewood Cliffs, NJ: Prentice Hall

Norman, G., & Schmidt, H. G. (1992). The psychological basis of Problem-based Learning: A review of the evidence. *Academic Medicine,* 67(9), 557–565.

Oliver, R., & Towers, S. (2000). Up time: Students, learning and computers. A study of ICT literacy and access among Australian tertiary students. Canberra, Australia: Department of Education, Training and Youth Affairs

Resnick, L. B., & Glaser, R. (1976). Problem solving and Intelligence. In L. B. Resnick (Ed), *The nature of intelligence* (pp. 205–231). New York: Lawrence Erlbaum Associates

Schmidt, H. G. (1993a). Foundations of problem-based learning: some explanatory notes. *Medical Education*, 27, 422–432.

Schmidt, H. G. (1993b). Problem-based learning: rationale and description. *Medical Education*, 17, 11–16.

Schmidt, W. H. O. (1965). Process of learning in relation to different kinds of materials to be learnt. In J. V. O. Reid & A. J. Wilmont (Eds), *Medical Education in South Africa* Pietermaritzburg, South Africa: Natal University Press (pp. 228–232).

Woods, Donald R. (1994). *Problem-based Learning: How to Gain the Most from PBL*. Waterdown, ON: Donald R. Woods.

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Personality type and learning environments: Two case studies

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Research by the author has been conducted previously that explores the similarities and differences in online and face-to-face environments, and the exploration of personality type and the learner's experience of the online learning environment. This paper presents two case studies of learners who were categorised using the Myers Briggs Type Inventory® according to their connection with the outer world (the Extraversion / Introversion dichotomy and the Judging / Perceiving dichotomy), describing their physical learning environments and the different needs that each environment presents and meets. It then explores possible ways that the online environment might complement the physical learning environment and meet the same needs, discussing the implications for the online environment.

Keywords: personality type, learning environments

Introduction

There is a growing body of research that looks at personality type and aspects of online learning. Studies have been conducted that discuss the relationship of personality type and the online asynchronous discussion, some with a focus on group learning (Lee & Lee, 2006), some on collaborative partnerships (Ahn, 2003; Russell, 2002) and others on the level of participation (Ellis, 2003; Ellsworth, 1995). Others focussed on learner needs in the online environment and personality type (Irani, Telg, Scherler, & Harrington, 2003; Mupinga, Nora, & Yaw, 2006), others have explored the link between personality and attitudes towards technology (Chambers, Hardy, Smith, & Sienty, 2003), and yet others have investigated personality characteristics and technology use (Buboltz, Young, & Wilkinson, 2003).

Previous research conducted by the author (Ellis, 2001) had investigated the differences between the online and face-to-face environments. Subsequent research (Ellis, 2003) explored the relationship between learners' personality type and their attitude towards, and participation in using aspects of, the online learning environment. At the same time workshops were being conducted that helped learners to explore their physical learning environments.

As Alexander and Boud (2001) say, in their discussion of experiential learning and its relationship to the online environment, "there is no doubt that the physical environment has a surprisingly powerful influence on teaching. … but it does not change the fundamental process of human learning. … in the most basic sense, the online learning environment is just another physical learning environment: more complex than some others, but a new space for teaching and learning" (p. 4). This prompted further exploration of learners' physical learning environments and whether there were aspects of online learning environments that provided a similar focus and met the needs learners felt were important to them in the real world environment.

This paper presents two case studies of learners who, as determined by the Myers Briggs Type Indicator® (MBTI), were categorised using the Myers Briggs Type Indicator® according to their connection with the outer world (the Extraversion / Introversion dichotomy and the Judging / Perceiving dichotomy), describing their physical learning environments and the different needs that each environment presents and meets. It then explores possible ways that the online environment might complement the physical learning environment and meet the same needs.

Personality type

Personality type in this paper is determined using the Myers Briggs Type Indicator® personality inventory. This is a self-report questionnaire that is based on Jung's personality type, that is, "the way people perceive and the way they make judgments. *Perceiving* here is understood to include the processes of becoming aware of things, people, occurrences and ideas. *Judging* includes the processes of coming to conclusions about what has been perceived" (Myers & Myers, 1995, p. 1). These two ways of functioning determine how people behave – what they see in a situation and what they do about it.

Personality and its relationship to the outer world

It is not enough, however, to categorize people on their perceiving function (i.e. sensing (S) – focussed on information from the senses or intuition (N) – focussed on concepts and ideas) and their decision-making or judging function (i.e. thinking (T) – decisions based on logic or feeling (F) – decisions based on a personal value system). These functions interrelate in a variety of ways, and in order to understand how this happens for the different types, it is necessary to look at the four attitudes or orientations of extraversion, introversion, judging and perceiving. These attitudes have a profound effect on a person's relationship with the outer world – the attitude and attention a person gives to the outer world (extraversion or introversion) and what of his / her judging or perceiving function is shown to the outer world (judging or perceiving).

Extraversion (E) and Introversion (I) are seen as "complementary attitudes or orientations of energy. … In the Extraverted attitude, energy and attention flow out, or are drawn out, to the objects and people in the environment" (Myers, McCauley, Quenk, & Hammer, 1998, pp. 25-26). Extraverts will therefore, be energised by interaction with others and will be keen to interact, often showing "a desire to 'talk things out' " (Myers et al., 1998, p. 26), particularly in the first instance to aid with learning activities such as problem solving and analysis.

On the other hand, "in the Introverted attitude, energy is drawn from the environment toward inner experience and reflection. … The main interests of the Introverted type are in the world of concepts, ideas, and inner experiences" (Myers et al., 1998, p. 26). Introverts will feel most energized when working on ideas by themselves, often preferring in the first instance to reflect by themselves when undertaking similar learning activities, as they often show "a desire to 'think things out' before talking about them" (Myers et al., 1998, p. 26).

Judging (J) and Perceiving (P) are the attitudes that determine how a person interacts with the outer world. Those with a J type preference will habitually use their decision making function when interacting with the outer world. They tend to draw conclusions and make decisions quickly preferring order and up-front planning and it is this that they show to the outer world. Those who have a P type preference focus on the perception of information when interacting with the outer world. They tend to delay making decisions, feeling it is necessary to continue to collect information for as long as possible before reaching closure. They will be prepared to allow options to stay open and prefer a less ordered approach than those with a J type preference (Myers et al., 1998).

It is important to note that extraverts, whose preference is for interacting with the outer world, will show their dominant preference to the outside world. This will be their perceiving function (sensing or intuition) for those with a P type preference and their judging function (thinking or feeling) for those with a J type. Introverts, however, whose preference is for their internal world, will show their second best or auxiliary preference as determined by the J-P dichotomy to the outside world, keeping their dominant preference internalised.

It is this focus on the outer world (i.e. Extraversion / Introversion combined with Judging / Perceiving) that has been used to categorise the students and subsequently have them explore the nature of their preferred learning environment.

E-P group characteristics

These people show their dominant perceiving function of either sensing or intuition to the outer world. For this group one would expect to see considerable variety and little formal order, with emphasis on creativity, physical comfort and interaction with others.

E-J group characteristics

These people show their dominant judging function of either thinking or feeling to the outer world. For this group one would expect to see a more structured environment than for E-P types, but still focussed on interaction with others and the outer world.

I-P group characteristics

These people show their auxiliary perceiving function to the outer world, internalising their dominant judging function. For this group one would expect to see much more focus on the individual inner world of ideas rather than their outer world. External environments are often irrelevant or idealised.

I-J group characteristics

These people show their auxiliary judging function to the outer world, internalising their dominant perceiving function. For this group one would expect to see a well-structured external environment focussed on the individual. External order is needed to allow the introverted dominant perceiving function to have its full reign internally.

Personality type and learning environments

Extravert–introvert dichotomy

Research into personality type and learning environments, when focussing on the outer world, has concentrated on the extraversion–introversion dichotomy. Russell (2002) found that introverts found the asynchronous discussion environment less threatening than the face-to-face environment, because it provided time for reflection needed for engagement with their inner world. She also found that extraverts conversely preferred the face-to-face environment that allowed them to connect with others.

This need for reflection and connection with the inner world is also supported by Day and Batson (1995), who found that "reticent students … do not participate [in face-to-face-class discussion], simply because they do not 'think on their feet' as quickly as some of the other students" (p. 38).

Opt and Loffredo (2000) found introverts had significantly higher levels in communication apprehension in face-to-face environments. Taylor (1998) also found introverts preferred computer mediated seminars in preference to face-to-face ones, while extraverts preferred the face-to-face environment.

Where group collaboration was concerned, Ahn (2003) states that "extroverted [sic] types like discussions, verbal information, and active participation. On the other hand introverted type like large lectures and independent projects" (p. 1455). He found that introverts performed better in the asynchronous collaborative environment, while extraverts preferred the face-to-face environment. This supports the author's own findings that groups with predominantly introvert type personalities perform better in the asynchronous online collaborative environment than do extraverts (Ellis, 2003).

Judging–perceiving dichotomy

For the judging–perceiving dichotomy, importance of structure was evident for J type personalities. Russell (2002) found that J types liked the structure of the study guide, often using it in printed form. Buboltz et al. (2003), who used a different personality inventory than the MBTI, found that "for individuals that have a sense of duty, self-discipline and are conscientious they tend to use the computer more often in general" (p. 1144). This sense of duty fits well with those who have a J type personality, as they are concerned with making decisions and seeking closure (Myers et al., 1998).

The participants in the study

Case study one

The participants in case study one were 40 fourth year students enrolled in a Bachelor of Education degree. All students sat the MBTI formally, then were grouped according to a combination of the E-I / J-P dichotomies. Students split into groups of four or five students within their initial grouping. This resulted in three groups representing E-P, three groups representing E-J, two groups representing I-P and one group representing I-J. Each group was given a sheet of butcher's paper and marking pens and was asked to show what their physical learning environment would look like. Each group explained what was important to them when the final representations were discussed.

Case study two

The participants in case study two were tutors (all of whom were also postgraduate students) in a Faculty of Information Technology. These were categorised informally using a question relating to introversion / extraversion preference, then one related to the J-P dichotomy, resulting in one group of each category (I-P, E-P, I-J and E-J). The questions used to categorise the participants into the dichotomies were based on exercises normally used as part of the debriefing for people having formally taken the MBTI. After the representations had been drawn, the tutors came together as a large group, and for each representation were asked to describe what they saw.

The learning environment representations

E-P groups

Figure 1: E-P group 1 – case study one

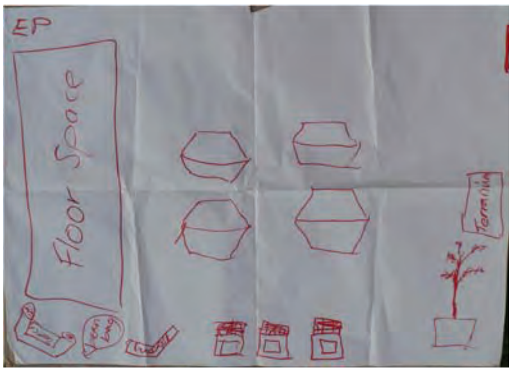

Figure 2: E-P group 2 – case study one

Figure 3: E-P group 3 – case study one

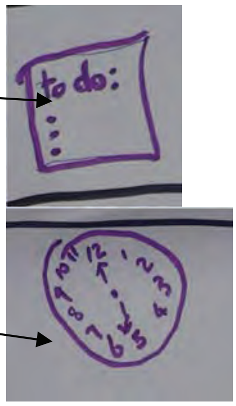

Figure 4: "To do list" and clock

Case study one – education students
All three groups (see Figures 1, 2 and 3) filled the page, with group1 in particular (see Figure 1), showing a busy, somewhat chaotic picture. The emphasis on external comfort is evident, as one would expect for an extraverted preference. Groups 1 and 2 indicated connectivity with other people. Group 3 included a "to do list" and a clock (see Figure 4), items not usually associated with the E-P type. When questioned, the students indicated a need for these things to keep on track with study, realising that without them they would not complete work on time.

Case study two – the tutor group
Similar to Group1 of case study one, this group shows a loud, exuberant diagram with the entire pages filled (see Figure 5). Both diagrams were drawn from the same group and, when limits are not placed on paper usage, E-P groups will tend to use more than one sheet, often feeling that their extraverted creativity needs more expression. Once again the emphasis on interaction with people and on external comfort is evident, as one would expect for an extraverted preference. In the second diagram, there is some attempt to employ structure, but this has been relegated to the bottom left-hand corner. In a similar way to E-P group 3 of case study one, the tutors indicated they were aware they needed structure in order to succeed in the university system, but it was relegated to the corner as a necessary evil. The descriptive words used by others included "chaos / messy" and "fullness / loud" whereas the group themselves used "ideas / creative", "group" and "physical comfort".

Figure 5: E-P group – case study two

E-J groups

Case study one – education students
Aspects relating to the external world and physical comfort were prevalent in the representations from all three groups (see Figures 6, 7 and 8), illustrating the E type preference. All three mentioned "space", "warm" or "warmth", and sound aspects (e.g. "little bit of background noise", "music / quiet sound") and two mentioned food and light aspects (i.e. "windows", sunlight", "bright"). The outward connection appears to be related to objects in the physical surroundings rather than people. Two groups commented on needing a solo study environment (i.e. "by oneself", "solo achievers"). When questioned one student indicated she knew if people were around she would be too distracted to get any effective study done, so deliberately isolated herself. Evidence of the J type preference appeared in two of the groups, both using words such as "organised" and "structure". All three groups chose to use text only for their representations and displayed a similar layout for the words on the page. The end result appeared neat and expansive. This would tend to illustrate an underlying sense of structure yet a connection to the outer world.

Case study two – the tutor group
Here (see Figure 9) the focus was more on learning rather than the environment itself, however the extravert preference appeared with reference to material resources (connection with objects) as well as interactivity with people and a focus on the lecturer. The J type preference was very evident in the structured form of the diagram. The description of the representation included the words "balance", "links", "concept map = relationship" and "clean / structure" indicating an ordered, balanced approach usually evidenced in a J type preference.

Figure 6: E-J group 1 – case study one

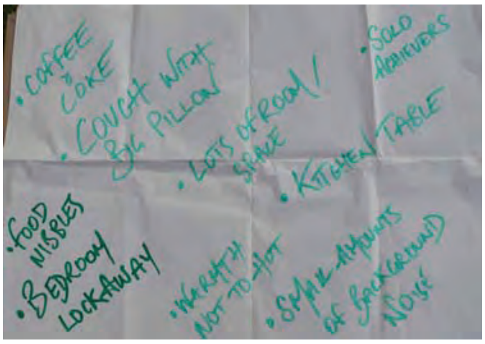

Figure 7: E-J group 2 – case study one

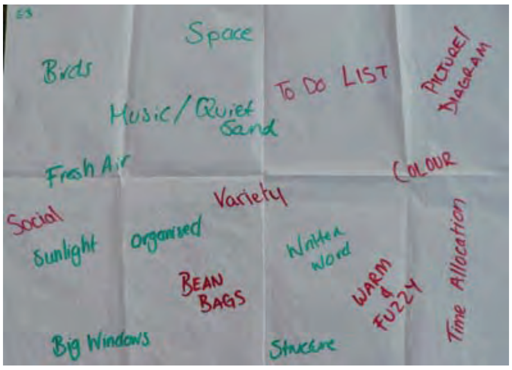

Figure 8: E-J group 3 – case study one

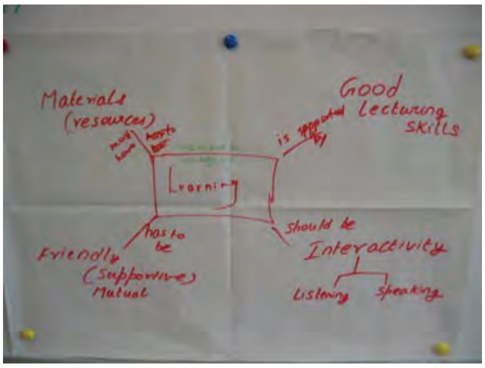

Figure 9: E-J group – case study two

I-P groups

Case study one – education students

The most striking feature of the representation (see Figure 10) was the use of only a portion of the page. The author has found, when running similar sessions, this has been a feature of other I-P groups. It is interesting to note that the stick figure is placed in the middle, between the detailed personal space and "other" features. When asked about this, the group indicated that the part on the left was their personal space while the part on the right was the outer world. The left hand side displays a well-structured environment, perhaps indicative of their introverted preference of structure (their decision making function is dominant for this group, but internalised). The right hand side is more nebulous, perhaps indicating that the outer world is not as important. The reference to a lot of open books (shown just above the stick figure) is indicative of their perceiving function shown to the outer world.

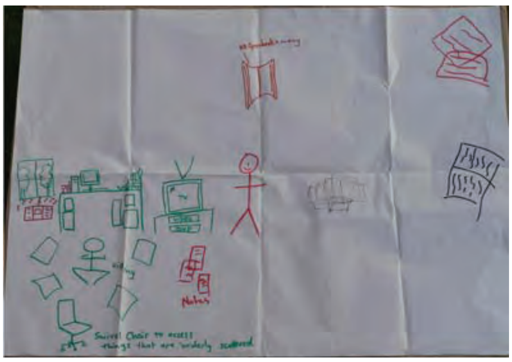

Figure 10: I-P group – case study one

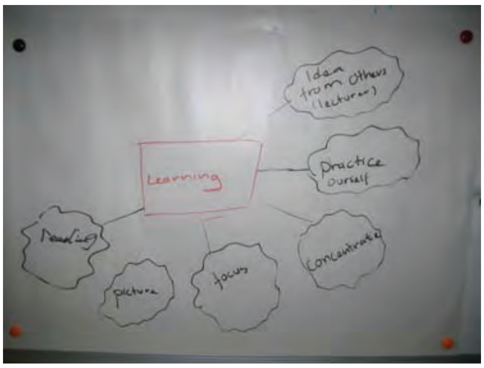

Figure 11: I-P group – case study two

Case study two – the tutor group

This representation (see Figure 11) also shows some evidence of only using part of the page. The layout is structured, however it appears to be somewhat internalised as indicated by the words "practice ourself", "focus" and "concentrate". The P type preference shown to the outer world appears to come through in the variety of sources of information (reading, picture, ideas from others). The words used to describe the representation were "detached", "ideas" and "concepts", indicating an introverted preference. Others described the diagram as "unfinished", while the group themselves described it as "open", indicating the P type preference shown to the outer world.

I-J group

Case study one – education students
This representation (see Figure 12) shows the typical individualistic, externally structured environment one would expect to see for an I-J type preference. Features include a neat, tidy, quiet environment, with the "to do list" in the bottom right hand corner shown as a major feature.

Case study two – the tutor group
In this case (see Figure 13), individuals in the group chose to draw their own separate representations. (see Figures 14 and 15 for detail), showing the individualistic characteristic common in the I-J preference. The bottom right hand corner contrasts a pleasant idealised scene with a list of words (e.g. "computer", "Internet", "snacks and drinks", "desk", "comfortable chair", "music / radio"). When asked about this diagram the tutor said the list represented his external environment while the scene was his internal environment that helped him work through his ideas. This supports the I-J type's dominant introverted perceiving function. For the top I-J representation (see Figure 15) the ever present list of the J type was present, with a range of resources as support but no connection with others, as one would expect for an introvert. Words used to describe the diagrams were "individual", "group = stress", "privacy", "inner focus", "structure" and "silence", once again focussing on the inner world of ideas.

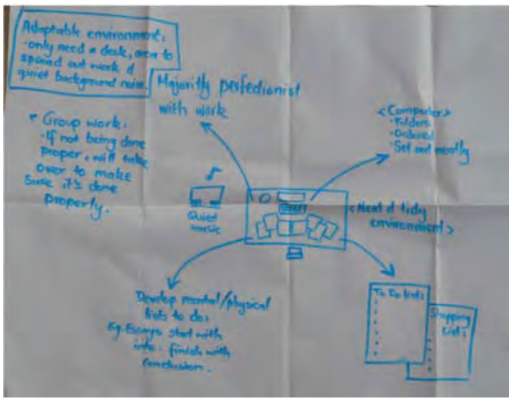

Figure 12: I-J group – case study one

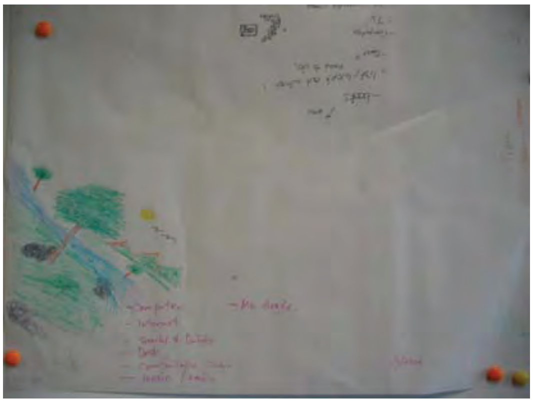

Figure 13: I-J group – case study two

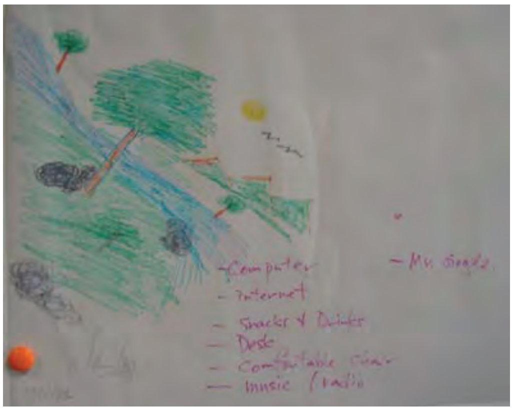

Figure 14: Detail of bottom LHS of Fig. 13

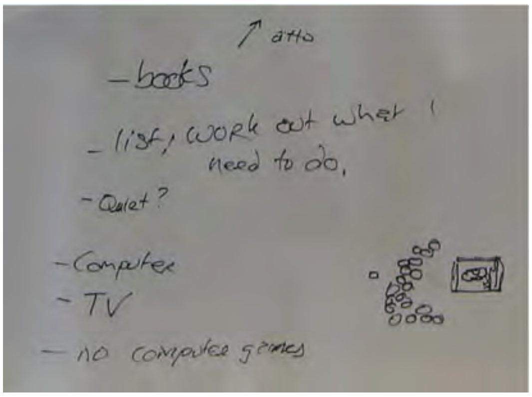

Figure 15: Detail of top RHS of Fig. 13

Implications for the online learning environment

A number of features have emerged from the above descriptions that should be considered for the online learning environment.

Physical and virtual surroundings

From the descriptions above, physical surroundings play an important part in the learning environment. Extraverts are very much aware of their physical surroundings and like them to be comfortable with a sense of space and airiness, while judging types need structure to their environment.

For the online environment, the layout and design of the virtual space may be just as important, particularly for extraverts. Such design could be facilitated by using icons that are connected in meaning as closely as possible to their real world counterparts (for the extraverts), colour schemes that reflect a sense of light and space (for the E-J types) and well structured (for the J types).

Personal versus group space

Introverted types need individual personal space for effective learning, while extraverts indicated connection with others is important. Provision in the online environment for both personal aspects of learning (e.g. a private journal) as well as opportunities for connection with others (e.g. an online café or shared workspace), are needed to suit both the introvert and the extravert. Often group workspaces are all shared, which does not provide the introvert with an area for personal reflection. Conversely when individual work is required, no casual environment for group discussion is made available for the extraverts.

Ensuring both asynchronous and synchronous means of connection with others, and the provision of interactive mechanisms beyond just text-based systems ensures both extraverts and introverts benefit from interaction with others. Extraverts, for whom interaction with others is essential, often find the online asynchronous text-based discussion environments lacking in the connectivity with others that they require (Ellis, 2003). Thus mechanisms for students to gain a sense of one another in the virtual environment are needed. This might be through the creation of personal video clips that others can view, or real time opportunities, particularly using audio-base chat. Conversely, introverts often appreciate the time afforded for inner reflection (Day & Batson, 1995) through the asynchronous discussion environment, finding synchronous discussion as stressful as face-to-face group communication.

Structure versus flexibility

Those with a judging type personality preference will prefer a structured environment. P types also often recognise the need for structure, as shown in Figures 3 and 5, while revelling in flexibility and opportunities to be creative. There is also a need to ensure appropriate structure for group collaboration as J types tend to collaborate better than P types in the online asynchronous environment (Ahn, 2003). Developing structure for the environment through student involvement can satisfy the needs of the J types, while encouraging the P types to embrace structure without feeling it is being imposed or stifling their creativity.

Creativity

The external expression of creativity appears to play an important role for E-P types, while internal creativity is important for I-J types. The opportunity for students to be able to express this creativity in various ways needs to be included in the online learning environment. This might involve the provision of a portfolio area for students to put down their own ideas and a shared space for those who wish to discuss and create with others. Such areas should be made available for non-assessable purposes, as making portfolio areas only available for assessable work tends to restrict the creativity aspects of learners – through time constraints for extraverts and through lack of privacy for introverts.

Conclusions and further research

By investigating learners' physical environments it is possible to identify aspects of those environments that the learners themselves deem necessary to support their learning and to highlight aspects of online learning environments that might mirror these aspects in the virtual world. However these case studies only scratch the surface of the learner's learning environment and its implications for online learning. Subsequent research is currently being undertaken to explore further the construction and use of learning environments from the learner's perspective when involved in online learning.

References

Ahn, J. (2003). *Personality of Learners and Group Collaboration Developments in E-Learning.* Paper presented at the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education (ELEARN), Phoenix, Arizona, USA.

Alexander, S., & Boud, D. (2001). Learners Still Learn From Experiences When Online. In J. Stephenson (Ed.), *Teaching and Learning Online: Pedagogies for New Technologies*. London: Kogan-Page Limited.

Buboltz, W., Young, T., & Wilkinson, L. (2003). *Online Behavior and Personality Correlates of Technological use.* Paper presented at the Society for Information Technology and Teacher Education International Conference (SITE), Albuquerque, New Mexico, USA.

Chambers, S. M., Hardy, J. C., Smith, B. J., & Sienty, S. F. (2003). Personality Indicators and Emergency Permit Teachers' Willingness to Embrace Technology. *Journal of Instructional Psychology,* 30(3), 185–188.

Day, M., & Batson, T. (1995). The Network-Based Writing Classroom: The ENFI Idea. In Z. L. Berge & M. P. Collins (Eds.), *Computer-Mediated Communication and the Online Classroom, Volume II: Higher Education* (Vol. 2, pp. 25–46).

Ellis, A. (2001). *Student-centred Collaborative Learning Via Face-to-face and Asynchronous Online Communication: What's the Difference?* Paper presented at the Meeting at the Crossroads : Proceedings of the Eighteenth Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education, Melbourne, Australia.

Ellis, A. E. (2003). Personality Type and Participation in Networked Learning Environments. *Education Media International,* 40(1/2), 101–114.

Ellsworth, J. H. (1995). Using Computer-Mediated Communication in Teaching University Courses. In Z. L. Berge & M. P. Collins (Eds.), *Computer-Mediated Communication and the Online Classroom, Volume 1: Overview and Perspectives* (Vol. 1, pp. 29–36).

Irani, T., Telg, R., Scherler, C., & Harrington, M. (2003). Personality Type and Its Relationship to Distance Education Students' Course Perceptions and Performance. *Quarterly Review of Distance Education*, 4(4), 445–453.

Lee, J., & Lee, Y. (2006). Personality Types and Learners' Interaction in Web-based Threaded Discussion. *Quarterly Review of Distance Education,* 7(1), 83–94.

Mupinga, D. M., Nora, R. T., & Yaw, D. C. (2006). The Learning Styles, Expectations, and Needs of Online Students. *College Teaching,* 54(1), 185–189.

Myers, I. B., McCauley, M. H., Quenk, N. L., & Hammer, A. L. (1998). *MBTI Manual: A Guide to the Development and Use of the Myers-Briggs Type Indicator* (3 ed.). Palo Alto, California: Consulting Psychologists Press, Inc.

Myers, I. B., & Myers, P. B. (1995). *Gifts Differing: Understanding Personality Type*. Palo Alto, CA: Davies-Black Publishing.

Opt, S. K., & Loffredo, D. A. (2000). Rethinking Communication Apprehension: A Myers-Briggs Perspective. *The Journal of Psychology,* 134(5), 556–570.

Russell, A. (2002). MBTI(R) Personality Preferences and Diverse Online Learning Experiences. *School Libraries Worldwide,* 8(1), 25–40.

Taylor, J. (1998). Using Asynchronous Computer-Conferencing to Encourage Interaction in Seminar Discussions. In R. Hazemi, S. Hailes & S. Wilbur (Eds.), *The Digital University: Reinventing the Academy* (pp. 219–232). London: Springer-Verlag.

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Perspectives of stakeholders on eLearning in science education at university

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This paper reports on three closely related studies designed to investigate the perceptions and expectations of eLearning held by stakeholders in the education of science students at University. The participants in the studies are undergraduate science students, parents of the science students and teachers of the students. A combination of qualitative and quantitative data gathering activities are used. Results show congruence amongst the stakeholders of a core role for eLearning in a predominately campus-based experience of learning science. This outcome has important implications for the perceived identity of the Faculty of Science and how it plans for its medium-term learning and teaching strategy.

Keywords: eLearning, stakeholder perspectives, science, higher education

Introduction

The affordances provided by eLearning for student experiences of higher education are no longer core business for only those universities with a mission to educate at a distance. Increasingly, university leaders perceive eLearning resourcing, management and evaluation as a core part of a campus-based experience for students. As eLearning becomes more deeply embedded in the student experience, the variety of stakeholders who have a vested interest in how eLearning supports students widens. In this paper, we look at the perspectives of students, parents and teachers in terms of how eLearning is shaping the experience of learning science in a predominately campus-based experience.

Background

The University of Sydney is systematically supporting the students' learning experience with eLearning activities and materials. In this paper, eLearning is defined as the use of information and communication technologies (ICTs) to enable student learning (HEFCE, 2005). After approximately five years of working towards an enterprise level approach to supporting eLearning, approximately half of all courses taught each year have some kind of eLearning presence on an enterprise learning management system. Some faculties with a history of eLearning are mature users of the medium as it complements a face-to-face experience, other faculties are just emerging as enterprise-level users, where enterprise is meant to indicate across-faculty use and awareness.

Amongst this activity is a growing awareness that, if it is to be sustainable, eLearning activity needs to be embedded in the learning and teaching system at the University. Course coordinators, heads of school, central support-providers are collecting data on how eLearning is influencing learning and teaching across the university. In this paper three short studies into how eLearning is influencing student learning in the Faculty of Science are considered.

Previous research

There is limited recent research related to expectations and experiences of learning technologies by stakeholders. The following reviews some of the prominent research into student expectations.

Student expectations and experiences of the new technologies in teaching and learning and how valuable they are have been the focus of several large surveys in recent years (McInnis, et al. 2000; Krause, et al. 2005). In Australia, following their previous work on student experiences of first year, McInnis et al. incorporated questions into their 1999 survey about the use of information and communication technologies (ICTs) in learning and found that whilst expectations were low, in reality students encountered a good deal of new technologies in teaching and learning in their courses (McInnis, et al. 2000). For example whilst just over a third of students expected a lot of use of multimedia software in teaching and learning, just over a half found a lot in reality. The latest survey (Krause, et al. 2005) makes assumptions that students now expect ICT resources, and concentrates on how useful these resources are for student learning.

A recent survey conducted in the United States of America asked students about their expectations for the use of technology in the classroom. It found that students expect a high use of IT within the classroom but that students did not perceive that this would necessarily ensure that the learning process was enhanced (Rickman and Grudzinski, 2000).

A long-term study in the UK indicates that students consider eLearning is helping to transform their education (Haywood, et al. 2004). The findings suggest that students hold positive views about the use of ICT in eLearning, the majority of students use ICT regularly in their studies and expect to be asked to do so, students see ICT as a positive feature in teaching and learning and generally they want more of what they have already experienced.

This paper complements and adds to this previous research by considering perspectives on eLearning from a number of stakeholders. Students, parents and teachers of the Faculty of Science at the University of Sydney were surveyed to investigate for their expectations and perspectives on eLearning.

The use of information and communication technologies (ICTs) in the Faculty of Science

The majority of Schools within the Faculty of Science at the University of Sydney (USyd) have been using ICTs for teaching or learning-related purposes since at least the mid-1980s. During the 1990s the amount and variety of ICTs used to support student learning steadily increased to the extent that it is probably very rare in 2006 for a student not to use at least some ICTs to complete required or assessable tasks for each unit of study that they take during their course. This is both an unsurprising fact and probably a universal experience for many university science students.

An interesting and widespread practice in USyd Science Schools is the use of professional or sub-professional data-management, data-interpretation, and/or modeling programs in the intermediate and/or senior years. While data-manipulation and graph-plotting by students using programs such as EXCEL is so common that one is tempted to describe it as a mandatory skill, most USyd science students will also commonly use purpose-specific macros or ‘spreadsheet routines’ to analyse and interpret data collected or measured in the field or laboratory. Programs such as Matlab, statistics packages, geographic information systems, forward and reverse modeling software, and/or discipline-specific packages are a common requirement in senior units of study and students taking physics, psychology, geology, geography, biochemistry, microbiology, mathematics, biology or chemistry will almost certainly be exposed to this use of ICTs. The use of ICTs for data analysis, interpretation and modeling is so widespread in USyd’s science schools that the academics contacted for this paper nominated the use of ICTs as a necessary, professional skill, a core part of the higher education experience.

It has been somewhat difficult to quantify precisely how much on-line learning support is provided for students in USyd’s science schools. An internal, unpublished survey of the Faculty undertaken in late 2004 found that majority of units of study (> 65%) and nearly all units of study with enrolments of more than 500 students (>95%) were supported in some way by websites. We have subsequently developed a three-fold classification of unit of study websites used to support student learning in the Faculty:

- Tier 1 websites provide students with administrative information such as class locations and times, course coordinator contact details, reading lists, etc.
- Tier 2 websites provide curriculum materials such as lecture notes, laboratory manuals, powerpoint quiz sheets, practice questions, worked examples, typically as HTML or PDF documents.
- Tier 3 websites provide students with interactive experiences that utilize the ability of ICTs to go beyond delivery of static text by providing such things as narrated powerpoints, animations, formative assessment opportunities, practice questions sometimes presented in steps that require students to choose between options; practice quizzes with feedback that may give students the option to reattempt the question; and commercial tutorial packages.

These three tiers are often conceptualised within the Faculty as informational resources (Tier 1), lecture and tutorial resources (Tier 2), and web-enabled learning activities (Tier 3).

In a faculty that provides nearly a thousand distinct units of study to its undergraduates it is hard to accurately assess just what a student will experience in terms of these three tiers. The data are hard to gather and units of study websites provide more and more varied material with time. Nevertheless the data we do have indicate the following trends:

- Tier 1 sites are relatively common throughout the Faculty (and it is worth noting that faculty policy will require all units of study to provide Tier 1 websites in 2007);
- Tier 2 sites are often used in units of study with enrolments of more than 150 students;
- Tier 3 sites are more commonly provided for the large-enrolment and/or first-year units of study than for small-enrolment units and/or intermediate and senior units.

An increased use of eLearning to support the student experience in the Faculty has given rise to the development of a variety of perspectives on how it should be used. This paper reports on the studies used to capture the perspectives of undergraduate science students, the parents of science students in the Faculty and science teachers.

Overview of studies conducted

Table 1 summaries the three related studies reported on in this paper, the research participants and the data collected. In these studies, key foci are stakeholder perspectives on what they expect from eLearning and what appropriate apportioning of the student learning experience might be between face-to-face and on-line contexts.

Table 1: Summary of studies, research participants and data

Study no.	Title	Research participants	Metrics
1	*Student experiences of eLearning in their degree*	Science students	SCEQ data Focus group data
2	*Parent expectations of eLearning for students*	Parents of science students	Open-ended question
3	*Staff expectations of eLearning for the experience of teaching*	Science teachers	Workshop evaluations Focus group data

Study 1: Student experiences of eLearning in the Faculty of Science

There were two parts to the study of student perceptions: part A – an analysis of data from the Student Course Experience Questionnaire (SCEQ) which is theoretically aligned to the national Course Experience Questionnaire, but is collected at the end of each year of a degree; and part B – focus groups comprising 40 + Science undergraduates enrolled in Geology 1001.

Part A: SCEQ analysis
The Student Course Experience Questionnaire (SCEQ) at the University of Sydney is aligned to the national CEQ and gathers data on students' perceptions of the quality of teaching and student learning in their degree courses as well as their perceptions of the administration and student support services. In 2005 additional items were developed to interrogate the growing perceptions held by students about eLearning. The relevant 2005 SCEQ data for undergraduate science students is shown in Table 2.

Table 2: 2005 SCEQ data for undergraduate science students

No.	Item	% responses	Descriptives	*n*
1	The resources on University of Sydney websites (WebCT, degree course sites, faculty sites) support my learning	80% agree	Mean = +5.1 SD = 0.44	400
2	Communication on-line with students and staff helped my learning	44% agree 37% neutral	Mean = +14 SD = 0.47	399
3	My on-line experiences helped me engage actively in my learning	50% agreed	Mean = +19 SD =0.44	396
4	My on-line experiences and face-to-face learning were well integrated	51% agreed	Mean = +21 SD = 0.44	399

Given the items in Table 2 have been used for the first time in 2005, they form the beginnings of a baseline of data for the effectiveness of on-line learning as rated by science students across the faculty. While perceptions of the value of websites for learning were relatively quite high, perceptions of the value of communicating on-line and the associations between the on-line part of the experience with the whole experience were comparatively lower.

Part B: Focus group
Students from an undergraduate geology degree were asked to attend a focus group on eLearning. Forty four students volunteered and were divided into two focus group sessions that followed the same structure. In each focus group session, the whole student group was divided into smaller groups of four or five participants and the purpose of the focus group (that is, improving the way we design and teach eLearning for their learning experiences) was explained to them. The facilitator briefly reviewed the questions with the students to provide a shared context for discussion. Each group then nominated a scribe and a presenter. The scribe wrote up the group responses on an overhead. The student presenters of each group briefly reported their group's answers to the whole group, during which the teacher/facilitator summarized common issues across all groups then asked the whole class to vote on the importance of these issues. Table 3 summarises the discussion questions, student responses and the student ratings of the answers to those questions.

Table 3 can be read as three columns. Column one shows the nine questions put to each group of five students. Each question has three answers which were the most common responses made from amongst the nine groups of four or five students. Each response was voted on by all students. Column two shows the number of students who voted that the answers provided were important issues for them. Column three gives the percentages of column two.

A quick overview of the responses from the students indicates that the majority rated a more standardised use of eLearning resources highly (question 3 and 4). Students seem to want an integrated experience (question 8, 9 and 1) with common activities and materials on each unit of study website (question 1 and 3) and they expect resources on websites to keep pace with the pace of discussion in lectures, accessible from most places on campus (question 5 and 6). With these sorts of resources, all students expected some on-line learning as a core part of their experience (question 7).

Study 2: Parent expectations of eLearning for their children' studies

The Faculty of Science at the University of Sydney runs a Student Transition Workshop and Parents' Program annually. This year, a question investigating parental attitudes towards the amount of eLearning their children may experience as part of their degree was included in the Parent's Program evaluation survey. The question read:

Students report an expectation of having some on-line learning materials and activities available as part of their university learning experience. How would you feel about your son or daughter completing up to 30% of their learning experience on-line so that they can fit in work and family commitments?

Table 3: Student perceptions of eLearning in undergraduate Science

Questions and responses	Rated as important by students (*n*=44)	
1 What eLearning materials and activities best support your learning? Why are they useful?		
a) conceptual outlines of lectures available on-line before lectures. They help you to take better notes and understand the lecture because you have a framework.	a. 42	a. 95%
b) worked examples of exams/assignments/ tutorial exercises. They give you an idea of the standards expected.	b. 41	b. 93%
c) quizzes for formative self testing. You can check your understanding as you go.	c. 22	c. 50%
2. What eLearning materials and activities don't work very well? Why aren't they useful?		
a) hard to find resources because you can't locate them quickly enough	a. 31	a. 70%
b) material not posted on time because it doesn't help preparation	b. 19	b. 43%
c) uneven use of eLearning resources across our units of study because expectations are lowered	c. 16	c. 36%
3. What eLearning materials and activities would you like to see more of in your unit of study?		
a) standardised of support for all unit sites (units of study guides, lecture guides, assessment guidance)	a. 21	a. 48%
b) more even distribution of eLearning across all units of study in our degrees	b 18	b 41%
c) a list of FAQs on all unit of study websites	c. 18	c. 41%
4. What is the minimum you expect in terms of eLearning materials and activities for a unit of study?		
a) unit outline with assessment information, calendar, links to library resources	a. 44	a. 100%
b) lecture outlines in ppt/pdf/ format before the lecture.	b. 43	b. 96%
c) announcements, exam timetables, task answers	c. 20	c. 45%
5. What guidance on how to use the eLearning materials and activities do you expect when you begin a unit?		
a) lecturer to provide a quick run through on what to look for and how to find it and what it is for	a. 33	a. 75%
b) lecturers to keep pace with materials planned for and posted on unit websites	b. 21	b. 48%
c) pointers on how to make most of the Library resources	c. 14	c. 32%
6. Where do you expect to be able to access your unit of study websites on campus?		
a) lecture rooms, seminar and tutorial rooms and library	a. 40	a. 91%
b) in more access labs	b. 21	b. 48%
c) everywhere.	c. 10	c. 23%
7. The University has identified a study load of 9–12 hours per week for each 6 credit point unit of study as a standard. What is your expected weekly study load for each unit of study and how much of that would you expect to study on-line?		
a) 7 hours face to face to 1 hour on-line	a. 21	a. 48%
b) 8 hours face to face to 2 hours on-line	b. 16	b. 36%
c) 10 hours face to face to 2 hours on-line	c. 7	c. 16%
8. What do you see as the relationship between your eLearning materials and activities and what you do in class?		
a) should be integrated with activities in class. Offer more insight into material covered in class	a. 40	a. 91%
b) eLearning supplements the classroom experience. Add more ideas to what we already have.	b. 3	b. 7%
c) same copy of materials. Provide same ideas as in class.	c. 5	c. 11%
9. How could lectures be improved using new technologies?		
a) include simulation clips on unit of study websites	a. 23	a. 52%
b) used video clips to provide background and contextual information	b. 18	b. 41%
c) improved lecturer's presentation skills by using presentation technologies	c. 17	c. 39%

The responses were classified according to the scale shown in Table 4 (e.g. strong adjectives such as great or excellent indicating strong acceptance, unsure or ambivalent indicating neutrality, definitely not indicating strong negativity). The results of this analysis are given below.

Table 4: Classification of responses by parents (n = 85)

Strongly positive	Positive	Neutral	Negative	Strongly negative
13%	52%	16%	19%	1%
63%			20%	

The majority of responses were positive. This was particularly the case for parents whose children live in locations that involve considerable time traveling to and from university. Many positive responses were qualified by concerns about sufficient contact and social interaction. The negative responses provided the contrary view and generally indicated that an amount of 30% of the experience was too much and that this should be capped at a lower level of between 15% and 20%. Parents were also concerned that sufficient class time remained and that appropriate face-to-face 'back-up' was available for students who faced difficulties. Overall the indications are that quality on-line materials and activities that support learning will be favourably regarded by parents as long as the majority of the experience remains face-to-face.

Illuminative comments from the parents are shown in relation to comments from students and staff in Table 5.

Study 3: Expectations of science teachers

Information about the expectations and opinions of academic staff about the provision of on-line eLearning opportunities were gathered with an email survey. Most of the staff contacted are either involved in, or responsible for the delivery of units of study to large classes and were selected in such a way as to provide an indication of practice and opinion across the whole Faculty; that is, several members of each of the Science Faculty's Schools were contacted (except for staff in the School of Information Technology as these academics teach about and use ICT in teaching on a daily basis – which would introduce an obvious and confounding bias). The views of junior and intermediate year coordinators were particularly sought. Eighteen of the thirty staff contacted responded. Staff were asked to provide answers or comments in response to three questions: 1. What are one or two of the most useful eLearning activities or materials that you provide to students on-line? 2. In what way are these eLearning activities /materials useful? 3. If the university provided as much eLearning support as you wished, what do you think should be the average maximum percentage of the student experience that is put on-line in any one unit of study? Why?

All eighteen respondents provided students with resources (i.e. Tier Two sites) using the university learning management system WebCT or their own webpage and most (16 of the 18) also provided one or more interactive activities (i.e. Tier Three sites). All respondents indicated that '24/7' student access to on-line resources and administrative information was useful. Some staff indicated that students report that an advantage of on-line learning support materials is that they enable students to work through material at their own pace.

There were three broad types of response to the question about a maximum of on-line learning for students enrolled in the Faculty. In the first group, staff indicated that an upper limit should be placed on the amount of eLearning – generally somewhere up to thirty percent (and up to even forty percent if the materials were of high-quality and were part of a deliberately integrated and well-articulated teaching strategy). In the second group were staff who took a very broad view of the question and could envisage situations where a very high limit could be appropriate (e.g. 75% or 100%) while not currently contemplating such high levels themselves. In the third group were staff who felt that there should be 'no set limit' or otherwise indicated that it was not appropriate to set a maximum for on-line versus class experience – as the 'appropriate amount' would vary from subject to subject due to the specific requirements of a particular unit of study. Such appropriate amounts might be determined by the needs of the discipline, the year-group being taught, or the particular mix of skills and content that students were required to develop. See Table 5 for some illuminative quotations from staff.

Table 5: Summary of student, parent and teacher comments

Students What is the maximum amount of time per week you would expect to study on-line for each unit of study?			**Parents** How would you feel about your child completing up to 30% of their learning experience on-line?			**Teachers** What is the maximum amount of the student experience that should be delivered on-line?		
Categories n=44		**Students' comments**	**Categories n=85**		**Parents' comments**	**Categories n=18**		**Teachers' comments**
20 to 30% on-line	**52%** of stud-ents	'10 hours face to face to 2 hours on-line'	20 to 30% on-line	**63%** of parents	'Excellent, to be encouraged. Physical travel aspects eat up too much time' 'I have no problems with this as it will make uni more flexible' 'A good idea as long as there is also some form of individual support if problems arise from the on-line learning' 'I support this idea, it may be helpful to some student to fit in all the things that they have to do' 'No problems but face-to-face is important'	More than 30% on-line	**34%** of staff	I would not like to go beyond 75 per cent on-line. … human interaction is essential because (1) learning is not mechanical and a responsive teacher can cut to the chase and give prudent advice which avoids unnecessary frustration on the part of the self-learner (2) lectures put things in context, are entertaining and provide an opportunity to convey a sense of enthusiasm for a subject, and go beyond the core syllabus.
		'8 hours face to face to 2 hours on-line' 'should be integrated with activities in class. Offer more insight into material covered in class'				20 to 30% on-line		Face to face instruction, both interactive (in tutorials) and non-interactive (in lectures), remains the most effective way to guide students through the content. I believe eLearning should be seen as a way of supporting these activities, not a way to replace them.
not more than 20% on-line	48% of stud-ents	'7 hours face to face to 1 hour on-line'	not more than 20% on-line	20% of parents	'Some activities could be completed on-line but they should not exceed 20%' 'Thirty percent is too high! Maybe 15% would be alright' 'Maybe not as much as 30%'. 'Maybe not so much. Twenty percent, maximum. There is already too much isolation with computers in this generation.'	not more than 20% on-line	33% of staff	'The vast majority of the "student experience" should be in the real world, not a virtual one' 'A maximum of 20% … any more would contradict the current findings of research into student learning' …'This is a practical subject and the most useful skills are gained in the lab so replacing this experience with eLearning is not appropriate or desirable.'
0% students		Undecided	7% of parents		Undecided	33% of staff		Undecided

The extent of congruence of stakeholder perspectives and expectations

Table 5 presents a summary of illuminative comments made by students, parents and teachers about the apportioning of university learning experiences between face-to-face and on-line contexts.

Table 5 provides illuminative quotations from participants in the three studies. The table can be read as five rows. Rows one and two give the questions used and the population sample for the studies. Rows three, four and five provide the quotations from the stakeholders in each of the three studies and percentages of the population sample in relation to expectations of the amount of on-line learning.

All students (100%) expect to spend at least one hour per week on-line for each unit, with 52% of students indicate an expectation somewhere between 20–30%. The majority of the parents (63%) are comfortable that their child should complete between 20–30% of their learning experiences on-line. 67% of teachers surveyed support the idea that at least 20–30% of the student experience could be supported predominately on-line.

Discussion

This paper has reported on the outcome of three related studies into stakeholder expectations of, and perspectives on, eLearning in the experience of learning science at university. The stakeholders consulted were students, parents and teachers. SCEQ data and the outcomes of focus groups capture a student perspective, an open-ended survey question captures the parent perspective, and an email survey captures the teacher perspective.

If we consider outcomes that are similar from the three studies, it would appear that science students, parents and teachers have an expectation that eLearning is a natural part of a university student learning experience for even predominately campus-based learning experiences. While those who are aware of the benefits of eLearning might find this unremarkable, it suggests the beginning of a cultural shift in stakeholder expectations at this research-intensive, campus-based university. Fortunately these expectations have been matched by funding by the University managers over the last few years. Nevertheless, it is only through recognition by the University community of the role of eLearning in the core-business of the student experience that will ensure its ongoing funding and strategic use for the benefits of students and teachers and the reputation of the University.

Another outcome that is similar amongst the stakeholder perspectives is the proportion of eLearning in the whole student learning experience. While it varies slightly, significant percentages of students, parents and teachers feel that somewhere between 20-30% of the student experience should be supported on-line without the attractiveness and benefits of a face-to-face experience of learning being put at risk. It should be noted that this is not an argument for all courses to adopt this proportion in their course design. As one teacher noted:

> It is difficult to come up with a percentage of on-line versus other experiences… ‘It really depends on the learning outcomes … There needs to be constant evaluation of the activities, the usage & perceived usefulness.’ ‘It depends on the unit & year group … Seniors are much more independent & could have a greater percentage of eLearning in their courses. Junior students may require more face-to-face interaction.’ ‘There is no 'right' amount. The blend will depend on the subject.’ ‘Some disciplines are very suited to eLearning, others not.

Rather, this percentage can be used as a rule-of-thumb helping to suggest to the University community how eLearning can support a campus-based experience, without taking away from its perceived advantages by key stakeholders.

If we reflect on the expectations upon which these outcomes are based, then their force increases. Table 3 show reasonably modest expectations of students. When asked what eLearning resources best support their learning students expectations were conceptual outlines of lectures available on-line before lectures, worked examples of exams/assignments/ tutorial exercises and quizzes for formative self testing. While useful, these are modest expectations given what we know about the richness of learning that can be supported by eLearning activities (Salmon, 2002), extended learning discussions (Laurillard, 2002), contributing students (Collis and Moonen, 2001), and the benefits of networked communities for learning (Goodyear et al., 2005). If the Faculty of Science can start to raise student awareness of these types of benefits, then eLearning will become even more embedded in the student experience.

Conclusions

This study provides a snapshot of the perspectives and expectations of stakeholders on eLearning in science education. Focus groups and surveys with students, an open-ended questionnaire with parents and email surveys with staff have provided some insight into developing perceptions and expectations from stakeholders of science education in the Faculty about the role and place of eLearning.

It should be noted that the population samples of the studies are relatively small, so any conclusions drawn should be indicative of trends in perspectives and expectations of eLearning rather than established standards. Nevertheless, the coherence of broad outcomes of the three studies offer some evidence of changing expectations of the role of eLearning in campus-based learning experiences. While there is some variation amongst the three groups, there is significant congruence amongst expectations that suggests that eLearning is now an expected core activity for student learning in the Faculty.

Of the three groups surveyed, it seems that the largest proportion of undecided stakeholders rests with about a third of teachers (see Table 5). This is probably understandable as the cost/benefit of preparing eLearning resources for the student experience is most keenly felt by them. If eLearning is a key strategy for the Faculty's learning and teaching approach over the medium term future, then it is encumbant on all those who have a responsibility to further an appropriate use of eLearning in the University to consider the teachers' perspective, given the goal is to improve student learning. Too often at present fundamental issues such as workload recognition for the preparation of materials and budgeting for on-line tutoring are barriers to a more meaningful use and integration of eLearning. These are the types of issues which will have to be addressed if elaborating the student experience of learning through eLearning is to become a sustainable activity in the Faculty.

As the Faculty of Science continues to raise the minimum standards for eLearning resources in the student experience over the next few years, it is not only raising the expectations of key stakeholders, but it is developing a discipline-specific basis of experience and knowledge which is necessary for an appropriate use of eLearning in a predominately campus-based learning experience of science students. This is an appropriate goal for a faculty claiming a modern approach to learning and teaching, one that is recognized as core-business for the well-being of the Faculty's future.

References

Collis, B., & Moonen, J. (2001). *Flexible Learning in a Digital World: Experiences and Expectations.* London: Kogan Page.

Goodyear, P., Jones, C., Asensio, M., Hodgson, V., and Steeples, C. (2005). Networked learning in higher education: students' expectations and experiences. *Higher Education*, (50), 473–508.

Haywood, J., Macleod, H., Haywood, D., Mogey, N. and Alexander, W. (2004). The Student View of ICT in Education at the University of Edinburgh: skills, attitudes and expectations. Research *proceedings of the Association for Learning Technology Conference*, Exeter, 229–245.

HEFCE, (2005). *E-Learning Strategy*. HEFCE, London.

Krause, K., Hartley, R., James, R. & McInnis, C. (2005) *The First Year Experience in Australian Universities: Findings from a Decade of National Studies.* Canberra: AGPS.

Laurillard, D. (2002). *Rethinking University Teaching*. (2nd ed.). London: Routledge.

McInnis, C., James, R. & Hartley, R. (2000). *Trends in the first year experience in Australian universities*. Canberra: AGPS.

Rickman, J. and Grudzinski, M. (2000). Students expectations of Information Technology Use in the Classroom. *Educause Quarterly* Number 1 24–30.
Salmon, G. (2001). E-moderating: the key to teaching and learning online. London: Kogan Page.
Salmon, G. (2002). E-tivities: the key to active online learning. London: RoutledgeFalmer.

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Fostering communities of practice during the creation of an online classroom-based simulation

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Working with and managing a team can be a challenge in any project development. This paper reports on how a team of researchers, an instructional designer, programmers and graphic artists worked within a community of practice, as simulation software was created and further developed. The simulated classroom represented in this software was designed to enhance the initial practicum experience of pre-service teachers. The teaching of literacy skills in primary schools framed the pedagogical focus of the software – one of the priority areas within primary schooling. We report on how research associated with each iteration of the simulation prototype software helped team members to develop understandings of each other's role in the project. Initially the instructional designer, content experts and researchers led the development process, and other members were more like legitimate peripheral participants. Over time, all members of the team developed into legitimate participants, and formed a viable community of practice as ways to support initial teacher education were examined. We describe the processes we use to help all members of the design team enter the communities of practice through the opportunity to understand the context and purpose of the project.

Keywords: simulation, pre-service teacher education, communities of practice

Introduction

A community of practice is defined as a group of people who together accumulate and share their collective learning (Wenger, 2002). Often a 'communities of practice' approach is seen as a way to cultivate or nurture new knowledge by sharing existing tacit knowledge within an organization. During this project two distinct communities of practice emerged: one involved the pre-service teachers who engaged with the simulation software and the second involved the design team as the software was developed and refined from the research conducted with the students. However, these communities did not operate in isolation as common members from both communities provided links that facilitated the progressive development of the five iterations of the simulation.

Initially the instructional designer, content experts and researchers were leading the development process, while the other members (programmers and graphic artists) were more like legitimate peripheral participants. Over time, the other members of the team developed into legitimate participants, and formed a viable community of practice as new ways to support initial teacher education were developed. We believe that the research associated with successive iterations of the simulation prototype software not only helped team members to more fully understand each other's role in developing and improving the simulation – it also allowed the collective knowledge of the community to be more effectively used. Further the processes we used to help all members of the design team to become fully-fledged members of the community of practice is an important outcome of our research.

Thus the development and implementation of the online classroom simulation software reflected the increased understandings of the 'team' as they refined it by looking to the users, the input of team members and the literature for guidance.

Background to the ClassSim project

This project was grounded within our belief that the development of a classroom-based simulation is one way to support the range of learning strategies incorporated within teacher education programs (Aldrich, 2004; Queen, 1984). Limited research is reported on simulations in teacher development, but advances in gaming software, particularly those which involve players creating worlds (e.g. The Sims), have demonstrated that it is possible to create a simulation that can support pre-service teachers' professional learning (Sottile & Brozilk, 2004).

The intended audience of the simulated classroom was pre-service teachers enrolled in their first year of a primary teacher education degree, with the vision of enhancing their understanding of the work of a teacher in a lower primary classroom. A focus on the teaching of literacy skills in primary schools underpinned the software; this was considered appropriate as it is one of the keys to success in schooling (Cambourne, 2001). The simulation we developed supported users 'working' within the role of a teacher. The embedded tools provided within the simulation were designed to stimulate the pre-service teachers to acknowledge their preconceived ideas about the work of a teacher, and to reflect upon these as they developed new opinions and ways of thinking about the role of the classroom teacher.

The following research questions were devised to gain an understanding of the practical problems that the simulation was to address.

1 What does the current research say about the planning and organization of literacy lessons in lower primary school classrooms?
2 How can pre-service teachers experience this knowledge in ways that encourage them to reflect on their current experience and access additional knowledge?
3 What design affordances could best support the development of a community of practice amongst users?

Academic members of the research team who had recent classroom experience and access to considerable classroom-based observation data responded to question 1. They analysed a considerable volume of classroom-based data as they looked at literacy practices. In addition an extensive literature review on this topic provided direction for the software development. To respond to Question 2, the researchers developed teacher scripts of classroom learning events, designed to depict the research from Question 1. At the end of this stage we had a shared understanding of the practical problem and possible approaches; however, we needed to develop possible solutions within a theoretical framework. One of the most relevant articles we discovered was a review by Herrington, Oliver and Reeves (2003). This review identified nine design elements of situated learning environments, and the challenge for us was to operationalize as many of these as we could in an online simulation.

Reflection on the process

In total, five prototype versions of the simulation software have been trialled with cohorts of pre-service teachers. Our research findings from the implementation of the software have consistently shown that the opportunities provided in the software to slow down or accelerate classroom events, revisit and reflect on critical decision points and replay events in the light of new understandings helped pre-service teachers develop an understanding of the complexity of classroom interactions. It appears that these design features provide pre-service teachers with time to think critically about complex teaching situations, which relied on their ability to identify and respond to the virtual children's experiences. Further, their experience with the simulation enabled them to appreciate the complex role of the teacher, specifically the impact of subtle decisions that experienced teachers made during lessons**.** This contributed to the process of enhancement of self-efficacy and supports the findings reported by Thompson and Dass (2000) about the benefits of engaging in simulation experiences.

We believe that the conditions associated with the trials of the simulation supported the development of a community of practice amongst the participants. As each pre-service teacher engaged with the simulation, they showed that they were developing informed insights into the nature of classrooms and the work of a teacher. When they solved a problem, they often shared their experiences with peers – much like users of online games do. For example, when they encountered a decision point, pre-service teachers were able to talk with others about what they had done and the perceived implications. At other times they paused the simulation to discuss appropriate approaches to emerging challenge. The provision of time to work with the software individually, and then collaborate with others, positioned the pre-service teachers in such a way that they could begin to argue their beliefs, and challenge conflicting positions in an informed way. This is similar to findings reported by Brozik and Zapalska (2003) although the context in their case was different.

Each trial of the prototype was conducted in a multimedia computer laboratory that could hold up to 24 users. The programmers, graphic artist and instructional designer were located in the adjacent room, and could easily be called upon to fix 'bugs', observe interactions, and make comments to researchers during the scheduled trials. The whole design team was involved in the trials, and all members were able to see the impact of their work on the users. After each trial, the data from thinking spaces, observer notes and follow-up interviews, were collated and analysed as previously described. These were summarised and taken to a follow-up meeting with all team members.

The follow-up meetings commenced with a brief presentation of the summary and then all members were free to contribute. At the end of each session, plans were developed for the design of the next prototype discussed. Most of the time was spent in clarifying our understanding of what the users learnt, and how the design features contributed to this. Frank and open discussion about our future visions for the software helped all members to appreciate the unique contribution that each member was making to this project, and to further clarify the short-term and long-term goals of the project.

For example during the second iteration of the simulation we debated about whether to include animated graphics and sound to reinforce key concepts about student response to user selected actions. The instructional designer asked probing questions to elicit the purpose of these features, and how we thought this would enhance user understanding and conceptual development. Then the programmers and graphic artists explained the process of developing these, and the form they would take. We then explored the strengths and weaknesses of the different options, finally selecting the simplest approach that could achieve our goals.

Conclusion

During this project, repeated use of the simulation motivated many of the pre-service teachers to develop into small communities of practice (Lave & Wenger, 1991) to share their knowledge and experiences. They were involved in a process of interaction with others to produce and establish meaning among peers. From a situated cognition perspective, their learning occurred in a social setting through dialogue with others in the community. It becomes a process of reflecting, interpreting, and negotiating meaning among the participants of a community.

Members of the design team also formed a viable community of practice but it was for a different purpose. We feel that it was important that the following general principles were met in order for this community of practice to be viable:

1. Meetings were chaired by the instructional designer who provided opportunities for all members to share their knowledge and understandings.
2. The instructional designer communicated to all members that the collective expertise of the team was important for the success of the project and that everyone's expertise was valued.
3. Design modification decisions were based on real data that team members had gathered. This involved members of the team working with the users of the simulation. There was no dispute over the authenticity of the data.
4. The research data was used to help members of the team to understand how interaction with the simulation assisted user learning.
5. As the project evolved, the instructional designer ensured that members could see that their expertise was having a positive impact on its success.
6. Team members received multiple opportunities to demonstrate and/or publish articles about their work.

We acknowledge that many of these conditions are not new, and are similar to those expressed by Wenger (2002). However, we believe that is important that the leadership role of the instructional designer was a crucial factor in the success of this project. We conclude by stating that, in our experience, a community of practice does not just happen – it has to be formed, nurtured and continually reviewed. It is the responsibility of those empowered to lead such a community to ensure that the conditions that are conducive for the formation of such a community, are present and put into operation. The role of the instructional designer is seen as someone who leads the process of analysis of learning needs and goals and the development of a delivery system to meet those needs. But this role also requires the instructional designer to lead a team that develops into a viable community of practice.

References

Aldrich, C. (2004). *Simulations and the future of learning*. San Francisco: Pfeiffer.
Brozik, D. & Zapalska, A. (2003). Experimental game:Austion! *Academy of Educational Leadership Journal*, *7*(2), 930–103.
Cambourne, B.L. (2001) What do I do with the rest of the class? The Nature of Teaching-Learning Activities, *Language Arts*, 79, 2, Nov 2001 124–135.
Herrington, J., Oliver, R., & Reeves, T. (2003). 'Cognitive realism' in online authentic learning environments. In D. Lassner & C. McNaught (Eds.), *EdMedia World Conference on Educational Multimedia, Hypermedia and Telecommunications* (2115–2121), Norfolk, VA: AACE
Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge: Cambridge University Press.
Queen, J.A. (1984). Simulations in the classroom. *Improving College and University Teaching. 32* (3) 144–145.
Sottile, J.M. & Brozik, D. (2004) *The use of simulations in a teacher education program*. Hawaii International Conference on Education, January 3–6. ED490383.
Thompson, G.H. & Dass, P. (2000). Improving students' self-efficacy in strategic management: The relative impact of cases and simulations. *Simulation and Gaming*, *31*(1) 22–41.
Wenger, E. (2002). *Cultivating Communities of Practice*. Harvard Business School Press.

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Sustaining and transferring curriculum and pedagogical innovation through establishing communities of practice

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The lack of a sharing and collaborative culture within schools was identified as a key barrier to the successful implementation and scaling up of innovative practices using technology in education in Hong Kong, according to a government report (EMB, 2004). The report identified a need to develop more supportive structures and mechanisms to foster a shared culture and to establish communities of practices between teachers to encourage the sharing and the exchange of classroom experiences as well as to collaborate in curriculum and pedagogical innovation in and across schools. This paper outlines how a supportive structure was built by establishing the environments and infrastructure, focusing on building communities and partnerships. The paper presents the framework which guides the establishment of the communities and identifies mechanisms to foster a sharing and collaborative culture.

Keywords: building communities, sharing practices, teacher education

Introduction

Law's (in press) analysis of The Second International Information Technology in Education Study (SITES) M2 case study noted that pedagogical innovations in using technology in education are not difficult to find around the world but are hard to sustain and transfer. The lack of a sharing and collaborative culture within and between schools was identified as one of the key barriers to the successful implementation of innovative uses of technology in education. In alignment with the EMB stategies outlined in the 2004 document, Law (ibid) further stated that there is a need for the establishment of an implementation model for professional development and school change to build on the innovation and reform initiatives that have already started and are recorded in the SITES M2 cases. In Hong Kong, the government identified empowering "teachers with IT" (EMB, ibid) as one of the seven strategic targeted goals. To achieve this strategic goal so that teachers can take advantage of ICT to effectively bring about the kinds of curriculum and pedagogical changes advocated by the curriculum reform currently underway, there is a need to develop more effective support structures and mechanisms to foster the establishment of communities of practice in curriculum innovation for teachers. The experiences gained from running professional development activities based on the SITES M2 case studies (Yuen, Fox & Law, 2004), highlighted the need for a more extensive set of support mechanisms to increase the potential of sustaining and transferring innovative developments in schools.

In order to set up supporting structures and mechanisms that allow teachers to share and exchange experiences as well as to collaborate in curriculum and pedagogical innovation, during the period 2004–2005, EMB commissioned the Centre for Information Technology in Education (CITE) of the University of Hong Kong to establish a database to support the sharing of case studies of good practices in IT-supported teaching and learning in schools. The brief was that this database should also highlight the key dimensions of innovation as well as the features and contextual factors involved in each of the examples given. The objective of setting up this website (http://goodpractices.cite.hku.hk/) was to encourage teachers to share their own pedagogical uses of information and communication technology (ICT) with other interested education professionals, to establish networks of practitioners to reflect on practices and to support the formation of communities amongst teachers and principals.

This paper outlines a brief framework in designing this website, followed by the building of teacher communities and their support mechanisms.

Framework for the design of the Good Practices website

Research conducted on the use of the SITES M2 case studies (Law, 2004) identified a key strategy to establish a culture of ongoing professional sharing and collaboration was to provide a common environment where teachers can disseminate and share good practices to promote the use of IT in learning and teaching and to gain feedback from users to improve and consolidate their practices as well as to build up a community of interested practitioners. The following framework was used to guide the design and development of the Good Practices website. The main purpose for the Good Practices website was to create an innovation community, a mechanism for teachers to explore, share and reflect on their own pedagogic uses of ICT with others. The Good Practices website was not a database that would enable searching information ready-made packaged cases but rather an interactive and constructive professional development environment that would encourage teachers to learn about and share the tacit aspects associated with the complexities of implementing innovative pedagogical practices in schools. The Good Practices website was not therefore solely designed by and for the researchers but was designed and co-constructed with teachers involved in developing and reviewing case studies of good practices. Teachers were invited to share their ideas and comments on the structure, the content, activities and questions as well as technical issues during the design and production stages. The Good Practices environment was therefore conceptualized and co-constructed with the central involvement of the teachers who were to develop cases as well as use the cases to stimulate debate about good practices.

Nonaka and Takeuchi (1995) stated that knowledge can be transferred from an individual to a collective dimension and from the tacit to explicit form. Tacit knowledge here, refers to individual beliefs, ideas, mental models and ‘know how’ and forms part of the teacher’s intuition about teaching and learning gained through experience. Through discussion, reflection and debate this tacit knowledge can be transferred to explicit knowledge by participating in a socialization process, enabling this knowledge to be transmitted and exchanged in a shared community of practice. In developing a professional development environment a critical issue was to highlight teachers’ tacit knowledge. In designing the narrative template therefore, due emphasis was placed on eliciting teachers’ tacit knowledge of good practices. Questions concerning the implementation stages and procedures, difficulties encountered, ways to solve problems encountered as well as smart tips for implementation were included in each case. In addition, resources such as lesson plans, students’ authentic work, videos, photos, action plans and other learning and teaching materials that help readers to understand, empathise and interpret the case were included in the website. To facilitate the exchange and inquiry, a discussion forum was included for each case in the website.

Kubitskey, Fishman and Marx (2004) state that teachers in general are satisfied with practices which have served them well over time and often do not see any need for professional development to help them change their practices or to do things differently and that their own beliefs affects their teaching effectiveness (Meltzer et al. 2004; Stronge, 2002). In order to stimulate an examination of their own practices and to review others, Fullan (1991) argues that practitioners should always question their own ways of doing things and experiment with new ways. He suggests that it is only through trying out new ways that we really get to understand our own and others’ practices. Establishing professional development communities that encourage this questioning, reflection and trialing of new ideas is important. Shulman (1987) argues that this questioning is best done in situations that support collaboration, experimentation and a challenging discourse between practitioners. According to Darling-Hammond and McLaughlin (1995), effective professional development requires teachers to be provided with opportunities to reflect critically on their practice and to construct new knowledge and beliefs about content, pedagogy and learners. The Good Practices website was therefore designed to enable participating teachers to engage in a learning cycle of reflecting, thinking, doing, and evaluating. Teachers involved in developing and writing up the cases were asked to reflect on their own practices, and the role of the teacher, of students and the impact of the practices on student learning and were encouraged to evaluate and modify their practices as they interacted with fellow education professionals, exchanging ideas, experimenting and trialing new ideas. This ‘productive tinkering’ where teachers try out ideas and discuss levels of success with other teachers in a ‘conversation on practice’ (Yinger, 1987) was considered an essential part of the professional development process.

Building the communities

Twenty pilot schools in Hong Kong have been identified as Centres of Excellence – schools that have taken a leading role in integrating technology into the curriculum. These schools have been provided with extra support and funding from the government and in return are expected to take a leading role in cross-school activities and in leading and participating in seminars and workshops on technology integration. As part of the Good Practices initiative, two or three teachers from each of these schools were seconded out of normal school duties for one day per week for one year to work on IT-related matters. During this time, the teachers were required to take part in professional development activities, collect information on cases of good practices in IT from their own and others schools and attend workshops led by the Centre for IT in Education (CITE), the University of Hong Kong. Through its involvement in the SITES M2 study CITE has analysed in detail 130 innovative IT-supported pedagogical practices from 28 countries around the world. On the basis of their analysis, they have constructed a database of these innovative case studies to highlight the key dimensions of innovation as well as the features and contextual factors involved in each case study. CITE has also created an innovation community database, a sharing system for teachers to explore and reflect on their own pedagogical uses of IT with other interested educational professionals. Participation in the innovation community database provided teachers with a metacognitive experience through which they reflected on various aspects of their practice, including students' learning outcomes and school factors such as the amount and type of support from school leadership and colleagues, and the technological infrastructure involved.

The 70 teachers seconded from the Centres of Excellence schools who completed the CITE-led workshops then visited schools to introduce and discuss cases uploaded in the website, and to encourage debate and interaction with case teachers both online and face-to-face in schools and in seminars. The seconded teachers also helped the schools visited to identify their own examples of good practice for submission to the website. At the same time the government continued to encourage schools to participate in the good practices initiative by promoting good practices through various means. These include general dissemination of information and publicity, through running information seminars and through encouraging partnerships with commerce, for example with Microsoft, who have run technology and eleadership short courses and offered technical support and resources. The government has also offered staffing support to enable teachers to develop and write up their own cases. Teacher training institutions and especially the University of Hong Kong's CITE have also been involved in the project and have engaged in discussions about initial and continuous teacher training opportunities as well as running a series of related eleadership courses for principals, in which the Good Practices initiative was discussed and reviewed. Through and because of these initiatives the number of schools involved in the project has grown substantially over the course of its development. To increase the involvement of schools and in order further to advance lateral capacity building (Fullan, Hill & Crévola 2006) ongoing good practice initiatives have been organized, including government sponsored and university-led conferences with good practices as a major theme.

Conclusion

Based on the framework of knowledge as a socializing process from tacit to explicit, communities of practice and teachers as reflective practitioners, the Good Practices initiative is a collective effort of the teachers, principals, government, university and teacher training staff and others. Teachers have commented that the Good Practices website provides an important environment for them to share, exchange, discuss, reflect, and develop new practices. In order to scale up good practices, additional sub-communities need to be established and in each sub-community, teachers need to engage in action research in a collaborative effort. In this sense, teachers new role as action researchers will become not just professional development activities with a life span of one or two days, but a part of their role and vision of what they do as a professional.

The Good Practices project has encouraged not only a more sharing culture in schools and across schools but a greater willingness to share examples of good practice and to participate in discussions about how best various exemplar cases can be adopted across schools. What has become very clear is that straight forward replication of cases across schools is not a satisfactory way of scaling up innovations. As Fullan (2000) pointed out pedagogical innovation is complex and requires not only major structural changes in schools to support it but reculturing – the process where schools change ‘from a situation of limited attention to assessment and pedagogy to a situation in which teachers and others routinely focus on these matters and make associated improvements’ (ibid. p. 582).

A major challenge is how to sustain and scale up the work already started. All those involved agree that concerted effort and energy is needed from multiple levels within schools, from principals, panel heads and teachers, between schools and from government, teacher training institutions, universities and through links with the community and commerce. Multilevel leadership is essential for this initiative to succeed. The reculturing process that is needed, where attention is given to making continuous improvements and changes to the assessment and pedagogy will take time and much effort.

References

Darling-Hammond, L., & McLaughlin, L. (1995). Policies that support professional development in an era of reform. *Phi Delta Kappan, 76*(8), 587–604.

EMB Education and Manpower Bureau (2004, July). *Empowering learning and teaching with information technology*. Retrieved July 18, 2006 from http://www.emb.gov.hk/index.aspx?nodeid=2497&langno=1

Fullan, M. (1991). The *new meaning of educational change* (2nd ed.). New York: Teachers College Press.

Fullan, M. (2000). The three stories of educational reform. *Phi Delta Kappan*, *81*(8), 581–584.

Fullan, M., Hill, P., & Crévola, C. (2006). *Breakthrough.* Thousand Oaks, CA: Corwin Press, Toronto: Ontario Principals’ Council.

Kubitskey, B., Fishman, B., & Marx, R. (2004, April). Impact of professional development on a teacher and her students: a case study. Paper presented at the *Annual meeting of the American Educational research Association*. San Diego, CA.

Law, N. (2004). Teachers and Teaching Innovations in a Connected World. In A. Brown & N. Davis (Eds.), *Digital Technology*, Communities and Education. London: Kogan Page.

Law, N. (in press). Pedagogical innovations as systemic change: The challenge of sustainability and scalability. In C.H. Ng & P. Renshaw (Eds.), *Reforming learning: Issues, concepts and practices in the Asia-Pacific region*: Springer.

Meltzer, L., Reddy, R. Pollica, L. S., Roditi, B., Sayer, J., & Theokas, C. (2004). Positive and negative self-perceptions: is there a cyclical relationship between teachers’ and students’ perception of effort, strategy use, and academic performance. *Learning disabilities research and practice, 19*(1), 33–44.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company*. New York: Oxford University Press.

Shulman, L. (1987). Knowledge and teaching: foundations of the new reform. *Harvard Educational Review, 57*(1), 1–22.

Stronge, J. H. (2002). *Qualities of effective teachers.* Alexandria, VA. Association for Supervision and Curriculum Development.

Yinger, R. (1987). Learning the language of practice, *Curriculum Inquiry, 17*, 293–318.

Yuen, H.K., Fox, B., & Law, N. (2004). Curriculum innovations and multi-level e-leadership requirements: putting research into practice, *Asia-Pacific Cybereducation Journal*, 1(1), 11–18.

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Iterative learning: Self and peer assessment of group work

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Group work is commonly used to help students learn and develop team skills. However, many students report having poor experiences of assessable group work. While self and peer assessment can be used to reward student contributions more equitably in assessment contexts, careful design and support issues need addressing to ensure its success. This paper reports a social constructivist approach to assessing and improving group work. First, the literature linking summative and formative assessment with group work is reviewed. The importance of formative assessment in developing shared understandings between academics and students of the assessment criteria, in particular through self and peer ratings on criteria related to their group work contributions, is discussed. Second, findings from a pilot study, employing an online tool (SPARK) to enable collection and aggregation of self and peer ratings, are presented. Two cycles of data analysis, interpretation and reflections generate what we term iterative learning. Third, when carefully integrated, SPARK facilitates not only individual and groups of students to learn but also affords opportunities for academics to learn and refine assessment that increases student engagement. This paper will be useful for academics and academic developers seeking to support improved group work learning and assessment activities.

Keywords: formative assessment, group work, team work, self and peer assessment, SPARK, free riding, team skills, feedback

Introduction

This paper presents a social constructivist approach to assessing and improving group work. Students construct and re-construct meanings, acquire values, and develop skills and shared understandings about both group processes and the substantive subject by engaging participatively in a community of practice, oriented around assessable tasks in a subject. When supportive self and peer assessment processes are integrated, students can refine their ability to make judgements about what constitutes good team work, at the same time as developing their understanding of the assessment and grading processes. These skills are ones that students will use in the workplace as supervisors, managers and team members. As such, these are generic skills which universities are increasingly committed to developing in their students.

In a constructivist approach to assessing, the academic engages with students around the assessment criteria, the assessment processes and their feedback (Rust, O'Donovan & Price, 2005). This engagement assists in developing student understandings of the assessment criteria and their application. It also assists them in developing their understanding of the academic's tacit and explicit knowledge of applying assessment criteria and standards. Furthermore, when formative assessment is incorporated to developmental or practice activities prior to a summative assessment, the potential for improving subsequent summative assessment is enhanced. In addition to the student learning, the reflexive design processes used by staff in the evaluation of the teaching and assessment processes themselves are also a site of potential learning. By developing an iterative, discipline-based learning process in which the academic participates in a meta-analysis with academic developers, the feedback gained through self and peer assessment from students can be recursively employed in the second iteration of the subject. This emergent process drawing upon action research principles opens a space for the integration of formative and summative assessment as well as genuine participation and learning for students, academics and academic developers.

This paper reports on the learning related to self and peer assessment of group work from two iterations of a postgraduate subject. The first iteration (Freeman, Hutchinson & Treleaven, 2006) describes a deliberate strategy to focus on improving group work through attention to formative feedback to teams undertaking major group work assessment. The strategy employed a range of activities built around a computer-mediated assessment tool, Self and Peer Assessment Resource Kit (SPARK). SPARK is an online program for enabling confidential self and peer ratings to be aggregated and used for summative and formative assessment. When carefully integrated into the learning process, SPARK enables not only individual and groups of students to learn but also affords opportunities for academics to learn and improve the assessment process. The paper therefore presents both the first iteration of the course and feedback and the changes leading to the second iteration incorporated for the subsequent semester. The work involved a threefold collaboration between the lecturer, an experienced SPARK developer and an academic learning and teaching adviser.

The impetus for the initial study came from the need to improve group work experiences in the Faculty of Economics and Business at the University of Sydney. In the 2005 SCEQ (Student Course Evaluation Questionnaire), 10% of students' qualitative comments on the best aspect of their Course experience related to group work. Yet, another 10% of the qualitative comments identified group work as the aspect most in need of improvement. The Faculty therefore undertook to develop significant website resources to help students and staff engage in improved group work practices, as well as a commitment to support colleagues embed good practices identified in those website resources. The group work assessment study reported here is one of a number of such good practices being trialled.

In the paper that follows, the literature linking assessment with group work is first discussed. The pilot study of SPARK as a tool for formative assessment in the study site is then outlined. The analysis and interpretation of student responses to a questionnaire following their formative use of SPARK are then discussed. The iterative processes of further interpreting these results in the light of students' summative results are then reviewed including the changes proposed for subsequent use of SPARK as a more effective tool for formative feedback, supporting the development of teamwork and moderating the summative group assessment. Finally, the implications for formative use of this online self and peer assessment tool are drawn out, underscoring how assessment can support social learning processes in the classroom and reduce some of the problems of group work for staff and students.

Linking assessment and group work

This section reviews the literature linking assessment and group work. First, the links in the literature between summative assessment and group work are presented; second, the links between formative assessment and group work are considered; and third, the importance of integrating formative and summative approaches in improving group work is discussed.

Summative assessment and group work

The critical role of assessment in motivating learning is undeniable. In fact, Ramsden (2003, p.182) argues that 'from our students' point of view, assessment always defines the actual curriculum'. Summative assessment is most obvious because it is used to grade students. Students often fear its outcome because errors equate to punishment thus arousing 'passion, resistance and subterfuge' (Biggs, 2003, p.142–143). The problem with summative assessments is often exacerbated with group projects. These are commonly incorporated in economics and business units as assessments to motivate students to develop valuable generic graduate attributes such as teamwork and interpersonal communication skills. While there is the added benefit of reducing the number of assessments academics need to mark, there are real challenges particularly with group work primarily designed to be completed out-of-class. Fink (2004) notes two problems, namely the existence of free-riders and students dividing up the work to submit something akin to a collection of individual assignments. This temptation is not surprising given the challenges of finding mutually convenient meeting times to complete group work projects because Australian students are typically commuters and also because more students are working more hours in paid employment. Fink (2004) argues that a divide-and-conquer strategy defeats the purpose of the group work task. One solution to these problems is to engage students in self and peer assessment. As well as facilitating teamwork, Hanrahan and Isaacs (2001) argue self and peer assessment is an effective method for promoting the development of life long learning since students can be involved in judging their own or their peers' performance using criteria much as they need to be able to do in the workplace. To optimise engagement Biggs (2003) recommends actively involving students in the development of the assessment criteria and the decisions about what constitutes good evidence. Leach, Neutze and Zepke

(2001) note that non-conventional assessment can provide students with an empowered role. Learning how others evaluate is also useful and peer assessment of groups by groups (e.g. Freeman, 1995) is one way to extend peer assessment opportunities to learn critical evaluation skills.

As well as involving students in marking individual or group assignments via self and peer assessment, Goldfinch and Raeside (1990) and Goldfinch (1994) document a process of applying self and peer assessment to adjust summative teamwork marks into individual summative marks for team members by considering team processes. Self and peer assessment is a particularly useful method to award marks because it is difficult for the academic to know what individual contribution has occurred outside the class time. Peers or co-workers have more information than the academic. Individual contributions to achieving the group outcome might be in terms of the tasks to complete a team assignment or simply relate to implicit processes that improve group outcomes such as being inclusive and encouraging of others. Contributions are rated by all students in a team. These are then used to calculate an adjustment factor for each individual member that can be applied to the group mark. Interestingly, Lejk and Wyvill (2001) find more able students assessing their own contribution as lower than their less able peers.

Freeman and McKenzie (2002) extend Goldfinch's approach by developing a confidential online template to collect self and peer ratings and to calculate an adjustment factor for every student. A factor of 1.1 on a group mark of 20 out of 25 would result in a final individual mark of 22. SPARK has three main benefits according to Freeman and McKenzie (2002): it solves most of the administrative issues associated with paper-based approaches (i.e. data collection and analysis); students can confidentially make their ratings, and re-rate if necessary, online at any time during a rating period following completion of the project or project stage; multiple assessment criteria relating to different team tasks can easily be used to minimize the likelihood of the most recent task dominating perceptions of who did the work and how well it was done. Furthermore, it can be utilized for both formative and summative self and peer assessment.

Formative assessment and group work

Formative assessment is perhaps more critical to learning because students inevitably develop misconceptions in the process of the construction of their knowledge. Biggs (2003) argues that because making such errors does not have a grading impact students feel freer to make them. Instruction, correction and feedback should then assist students (and teachers) to identify what needs to be the focus of their future efforts.

Developing the right environment to facilitate students feeling free to make mistakes, and learn from them, is an important design issue and an important implementation issue. Academics can optimise the formative learning opportunities by maximising students' awareness of their own knowledge construction. This is achieved by learning activities which can be teacher-directed (e.g. feedback from a tutor in a tutorial), peer-directed (e.g. peer evaluation and feedback of a class presentation) or self-directed (e.g. optional use of self-paced online quizzes with auto-marked feedback). Self and peer assessment, discussed above in a summative context, can also be used for formative assessment purposes. Implementation shortcomings however, such as sarcastic comments or ratings from a peer about a team member's mistakes, can easily undo any clever tool or activity designed to encourage reflection, formative feedback and learning.

Other group work design features may facilitate a climate of formative feedback and reciprocal peer learning. According to Michaelsen, Knight and Fink (2004), permanent teams are more likely to nurture productive interaction and feedback patterns over time. There is also evidence that

> membership diversity initially inhibits both group processes and performance, but becomes a clear asset when members have worked together over an extended period of time.
> (Watson, Kumar & Michaelsen 1993, in Michaelsen, 2002, p.30)

Integrating formative and summative approaches

Formative feedback is optimally provided to students prior to their summative assessment (Higgins, Hartley and Skelton, 2002). Drawing upon the pioneering work of Scriven (1967) and Sadler (1989) in the area of formative assessment, Taras (2002; 2005) demonstrates the importance of integrating formative and summative approaches. The practice of detaching and prioritising summative approaches, while common in current assessment processes, is linked to poorer learning outcomes (Taras, 2002). Taras (2002; 2003) has shown the crucial importance of providing feedback to students prior to any summative assessment. She emphasises that

> any appearance of a grade or mark from peers or tutor, before students have had time to interiorise feedback on their work, interferes with the assimilation and understanding of this feedback. (Taras 2002, p.507)

She has therefore developed systems of peer and self assessment that integrate this approach into her assessment practices. Her practice has two distinctive features: firstly, minimal (i.e. according to the learning needs of the student), integrated tutor feedback, and secondly, tutor feedback and student self assessment takes place before students are provided with a grade (2002; p.549). Further she advocates that ‘processes, aims and products should all support each other and fit logically into a coherent interactive framework’ (Taras, 2006, p.373). This is consistent with Biggs’ (2003) notion of constructive alignment also taken up recently by Boud and Falchikow (2006), whereby

> the components in the teaching system, particularly the methods used and the assessment tasks are closely aligned to the learning activities assumed in the intended outcomes (p.400).

Other recent studies have emphasised the importance of social learning within group and teamwork processes and the important formative learning that occurs in such communities of practice (Lave & Wenger, 1991). Rust, O’Donovan and Price (2005) explore the application of theories of social construction to assessment processes. Since students often do not understand what is expected of them in assessments (O’Donovan, Price & Rust, 2001), they emphasise that

> one of the key issues underlying problems with assessment practice is that to truly understand the requirements of the assessment process – and the standards being applied – requires tacit as well as explicit knowledge (p.232).

They suggest that addressing problems of current practice and enhancing student learning experiences are possible by adopting a social constructivist view of learning drawing upon Vygotsky (1962; 1978) and Bruner (1986; 1990). This view proposes that

> knowledge is shaped and evolves through increasing participation within different communities of practice (Rust et al., 2005, p.232).

Further, adopting a constructivist approach underlines the importance of developing students’ capacity to make distinctions and judgments both about their own work and the work of others which is related to the capacity to make language based distinctions in a community of practice (Taylor, 1985; Tsoukas & Vladimirou, 2001). Boud and Falchikow (2006) discuss the need for students to learn to be assessors of both their own and others’ learning. This skill involves developing the capacity to make distinctions and judgements which are centrally important to knowledgeable practice (Tsoukas & Vladimirou, 2001). Boud and Falchinow (2006) also suggest that this type of knowledge is acquired in professional practice through socialisation and action processes. Such knowledge is always, therefore, socially constructed, so learning occurs within communities of practice (Lave & Wenger, 1991). These ideas are particularly consistent with group work and the formative processes that occur within them.

Pilot study: Self and peer assessment of group work

This study is based on a pilot application of self and peer assessment of group work contributions using SPARK in a core subject in a Master of Business program in Semester 1 2006. The course had an enrolment of 41 students. Each group of approximately five students was required to complete three assessments: two oral seminar presentations (with submission of visual aids) and a written assignment.

These group assessments provided the context for students to demonstrate that they met the University and Faculty learning goals to:

- communicate effectively in verbal, written and group contexts to a professional standard
- lead and participate in teams (including members from diverse cultural backgrounds)
- manage, persuade and influence others.

The aim in setting group seminar presentations as well as an assignment was to provide students with the opportunity to get to know each other's personalities, strengths and weaknesses and to develop inclusive processes required for team work, prior to completing their assignment. The two seminar presentations were relatively straightforward tasks involving, first, the use of a conceptual framework to answer a question about a business case, and, second, a critical evaluation of a single journal article. They could be completed satisfactorily with relatively low levels of teamwork. However, the assignment, due at the end of semester, was a major project in which students were required to analyse the sources of a specific business' competitive advantage. With great scope for differences in research, interpretation and approach, and no obvious way of sub-dividing the task into five separate components, this type of project could not be completed well without highly developed teamwork.

This assessment structure has been used in previous semesters. However, the challenge has been for the academic to provide effective and practical guidance on how to develop team skills, especially with large cohorts, and to provide strong incentives for students to learn to work as a team. SPARK was piloted to provide such incentives since students knew that peer assessment would moderate the group mark. By automating the self and peer assessment data collection and collation, SPARK also made it feasible to employ multiple assessment criteria covering both team processes and team tasks. It also had the administrative advantage of automatically generating the factors that are used to moderate group marks (e.g. an individual self and peer assessment (SPA) factor of 1.1 results in a mark of 22 when applied to a team mark of 20). Since it is an online tool, students could readily learn about it themselves and complete ratings more certain of confidentially. The fact that SPARK is well-researched gave further weight to its adoption. As a formative assessment tool, SPARK offered the opportunity of providing feedback on students' evaluations of group work contributions. By generating a ratio of self to peer evaluation (SAPA), students can gauge how their own perceptions of their individual contribution differ or are similar to peers' perceptions of their contribution (e.g. a 1.1 SAPA indicates an over inflated self view).

The academic, in consultation with the academic learning and teaching adviser, drafted preliminary criteria for evaluating group work contributions for each group assessment task. These distinguished between team processes and team tasks. They were then discussed with students who suggested several modifications and simplifications. In particular, students created an additional criterion distinguishing between the effort expended in research and the quality achieved in synthesising and interpreting the research material for the group assignment. The final criteria for group contribution to the seminar presentations are shown below on the SPARK rating screen (Figure 1). Since all criteria are weighted equally by SPARK in calculating the adjustment factors, the use of three team process criteria and three task criteria shows the importance placed on teamwork.

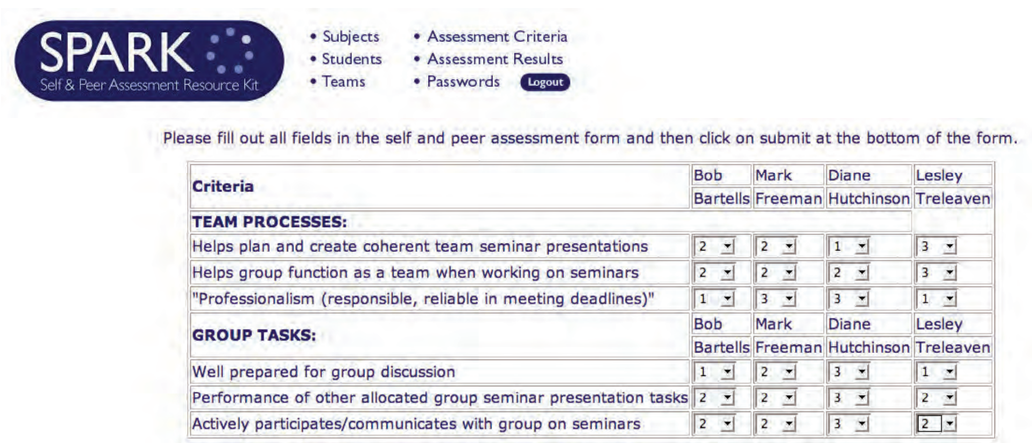

Figure 1: SPARK screenshot showing assessment criteria

Using these criteria, students carried out a formative self and peer evaluation of group work contributions to their seminar presentation in week 7. The results were discussed in the following class. At the end of semester, the students carried out summative self and peer evaluations for both the seminar presentations and the assignment, generating the weighting factors which were used to moderate group assessment marks. This process was evaluated through a confidential student questionnaire carried out prior to the summative ratings.

A first iteration: Interpreting questionnaire data

Findings from the first iteration of formative feedback are presented below. These findings are the first of two cycles of interpretation from which different understandings have been developed to inform the second iteration of the course. It is these cycles of data, analysis, interpretation and reflection that enable what we have termed here iterative learning. In the first cycle, questionnaire data related to the formative use of SPARK was examined independently of the academic, for reasons of participant confidentiality. In the second cycle, once student results in the course had been finalised and submitted, all data from the course, the summative peer and self ratings of their group work, the summative student results, and the qualitative comments on the formative study questionnaire were read by the academic. Reflections were discussed with the SPARK developer and learning and teaching developer. This reading brought the academic’s contextualised knowledge of the substantive course, the teams’ performances and the academic’s reflections on the implementation of SPARK and her teaching.

The role of group work in the course

All 34 students who responded to the question on the role of group work indicated that they understood the value of group work. Their understandings were consistent with the Faculty’s stated generic graduate attributes, especially in communication (‘learning how to function as a team’, ‘improve group work skills’ and ‘group decision making’, ‘cope with possible conflict’) research and inquiry (‘exchanging ideas’, ‘learn more from each through idea sharing’) and diversity (‘producing a superior presentation by utilising team strengths’, ‘learning how to deal with different people’).

The formative evaluation process

Students seem to have taken the formative self and peer assessment of group contributions seriously – of the 39 students who responded, 77% stated that they thought about their ratings before they logged on to enter their online individual and group ratings. While 13% responses were neutral, only 10% indicated that they did not consider how they would evaluate individual and group performance prior to logging on. Further, only 13% students logged back on to change their initial ratings, and two of these students were among those who reported that they had not thought about the ratings before initially logging on.

Students were asked what they learnt from engaging in the formative assessment process. Their answers provide evidence that the formative classroom feedback process helped give some students confidence in the peer assessment process (‘I could see the group valued my contribution’) while others pointed to the fact that the process showed them how their marks would be adjusted for their contribution, thus providing a reminder that contribution mattered. At the least, the formative feedback left these students better informed about the use of SPARK and its role as a self and peer tool, thereby reinforcing its incentive effects.

Noteworthy is the learning that some students gained from peer feedback. The Johari Window (Luft, 1970), which has been used extensively in group work, provides a useful framework to examine student reflections on their learning. Their comments in the questionnaire demonstrate that they gained insight into aspects of their performance that were not known previously to them (‘Some were oblivious to their contribution’, ‘sometimes you punish yourself, sometimes the others show you that you are not as good as you think’) and also insight into the awareness of others (‘some thought they worked harder than perceived by their peers’, ‘the evaluation of my contribution to the group was rated higher by the group than myself’). Other students came to understand that performance ratings ‘can depend on factors such as confidence and self deprecation.’

Students were also asked whether they changed their approach to their group work as a result of the formative assessment process. Only a relatively small number (9/39) indicated that they made changes. In the qualitative explanation of these answers, two students said they began to explain their contributions more clearly to their group, leading to better summative peer evaluation of contributions. Perhaps the most telling comment was about learning to give prospective rather than retrospective feedback to group members: 'group giving direct suggestions rather than use computer evaluations'. Some pointed to individual changes in their group work contributions such as trying 'to get into the activity greater (with much better result)', or working more towards the criteria. Another indicated that their group began to 'contact each other more frequently …making work more effective'. This suggests that, for at least some students, the formative evaluation did help to reinforce the need to work co-operatively.

However, for others the formative assessment was more an opportunity to 'confirm what I was doing was on the right track'. Such comments as 'good to monitor the contribution of each group members' and 'signals for each group member to contribute their best' were indicative of the way in which knowing that self and peer assessment would be conducted discouraged 'free riders' while emphasising that 'Group mark will be adjusted in relation to your contribution'. In this sense, SPARK can be seen as providing a pre-emptive approach to free riding.

A second iteration: Contextualising the data reading and interpretation

The second cycle of data analysis and interpretation enabled the broader role of SPARK to be examined from the perspective of its impact on the whole of the course. While students had not used SPARK for summative evaluations at the time of the questionnaire, they had been aware from the outset that it would be employed to moderate marks as well as provide formative feedback. They were asked in the questionnaire whether they thought the use of SPARK had helped their groups function better. 42% students responding to this question agreed the use of SPARK had supported their group work with comments such as 'reduces free riding', 'knowing that our group would self assess motivated individuals and group', 'members realise their responsibilities and roles', and 'it assists to improve marks'.

However, more students (48%) responded neutrally. This apparently ambivalent response can arguably be attributed to the pre-emptive effects of the use of a transparent peer and self assessment process to moderate group marks, especially when its role was reinforced through the formative assessment process. Interestingly, one student commented that SPARK 'doesn't help students much but the teacher gains understanding of student collaboration.' To some extent this comment is valid: SPARK enabled the academic to gain knowledge of the teamwork which would not otherwise have been available.

The academic's view was that more groups in this course developed good teamwork skills than had been the case in previous semesters, and the overall quality of the group assessments improved, with fewer assessments that were simply a collation of individual contributions. She also saw less evidence of free-riding. It is difficult to be precise about the impact of SPARK on this result but the academic sees it as part of a supportive process for group work which includes appropriate assessment design and constructive guidance. SPARK's role was that it allowed multiple criteria to be readily assessed, sending clear signals about the importance of teamwork, reinforced by the transparency of SPARK as an assessment tool, and the use of it for formative evaluations.

The students carried out their self and peer evaluations of contributions to each task simultaneously, but they made a distinction between the contributions on each task. The academic was concerned that the SPA adjustment factors for the subsequent written assignment task were more widely dispersed than for the seminar presentations with 41% of students' whose SPA adjustment factor was outside the .95–1.05 range for the assignment, compared to 32% for the seminar presentations. For the assignment there were also some extreme values such as .72, .76 and 1.19, resulting individual marks being more than 19% different to the group mark for the assignment. The academic concluded from this that some groups experienced greater problems working cooperatively on the assignment because they did not develop the necessary teamwork skills.

Once grades were finalised and the academic was able to read and reflect on the student questionnaires that had been held as confidential research until the subject's results were finalised, it became apparent that other, complementary steps were needed to further improve the quality of teamwork. The most revealing questionnaire responses were to questions on what students had learnt from the formative evaluation process and how they had changed their approach as a result of the formative evaluation. These responses included: ‘as our group was cohesive… there was no requirement’ and we did not change ‘because we’re satisfied with our performance’ or ‘we agreed we had no problem … and everyone was contributing [so] I did not need to change my approach’. These responses indicate harmonious and committed groups with no evidence of free-riding. While this provides a good starting point, it shows that they have no awareness of the need to further develop their teamwork to equip them for the assignment.

Iterative learning: Refining assessment for engagement

Consistent with constructivist approaches to assessment, the academic still believes that it is useful to begin with a simple group assessment such as seminar presentations, to provide a setting for students to learn each others strengths and to begin to devise inclusive approaches to ensure they use these strengths. But she is seeking to further explore and incorporate ways to more strongly emphasise the time and effort required to build teamwork, especially for more complex group assessments. Greater contextualisation of the results of the formative assessment of group contributions is important to consider. Specifically, she needs to convey that the seminar presentation was a task with limited choices and limited scope for different approaches, so it did not require highly developed teamwork to be completed satisfactorily. Students should not expect the same level of teamwork to carry them successfully through the more complex assignment.

After consultation with the academic learning and teaching adviser and the SPARK developer, the assessment process for the second iteration in a larger course in Semester 2 has been redesigned to reflect what the academic has learnt. There will be two group assessment tasks – a presentation and an assignment – to provide maximum opportunity for team work, but SPARK will be used twice for formative purposes. The first time will be mid-semester, after the seminar presentation, and the second time will be a little over two weeks before the assignment is due at the end of semester. This second formative evaluation may expose any weaknesses in teamwork skills while there is still time for corrective action, and more explicit guidance will be provided on the need for corrective action.

Also, in consultation with the academic adviser, the academic will ‘unpack’ the group work contribution criteria into more specific teamwork process components to provide students with clearer expectations about what is required. This unpacking of the often used, but taken for granted, academic discourse (Higgins et al., 2002), will involve extended discussion with students, since in the first pilot the students’ preference was for very simple, plain language criteria and some proposed criteria were modified to reflect this. The Faculty’s new group work website is also available now and will be used from the outset of the course to provide students with more guidance on how to develop skills required for teamwork.

Conclusions

Our study reveals the value of attending to the formative feedback process in group work assessment contexts. Students’ responses demonstrate how the lecturer’s previous concerns with group work have been reduced by the pre-emptive use of transparent, automated self and peer assessment. The confidential online tool for self and peer assessment not only provided an efficient teaching administrative mechanism for determining and moderating summative group marks between members, but allowed important refinements to the assessment process simply because it allowed an otherwise cumbersome process to be easily repeated several times. The results for the summative evaluations, especially in the case of the group assignment in contrast to the group presentations, were more widely distributed across the potential range than for the formative, raising questions around assessment complexity for further research.

Future iterations of self and peer assessment in the course, particularly those that focus on refining formative feedback are also worthy of further research. Guidance provided on a more structured formal process facilitating discussion of the formative evaluation results with appropriate time scheduled in the course may further enhance team skills development and individual and group learning outcomes. The implications of this study for academics in higher education extend beyond the economics and business context within which it was conducted. The development of collaborative skills to enhance team outcomes is a crucial graduate attribute of focus in almost all university contexts. Affordances from this type of educational technology provide academics and academic developers with the flexibility to trial and design refinements to learning and assessment activities to assist students to achieve these important skills.

References

Biggs, J. (2003). *Teaching for quality learning at university*. (2nd ed.). The Society for Research into Higher Education and Oxford University Press.

Boud, D., & Falchikow, N. (2006). Aligning assessment with long-term learning. *Assessment & Evaluation in Higher Education*, *31*(4), 399–413.

Bruner, J. (1986). *Actual Minds, Possible Worlds*. Cambridge, MA: Harvard University Press.

Bruner, J. (1990). *Acts of Meaning*. Cambridge, MA: Harvard University Press.

Faculty of Economics and Business (2006). Group work website. Available URL: http://groupwork.econ.usyd.edu.au/ [accessed 11.10.2006].

Fink, L.D. (2004). Beyond small groups: harnessing the extraordinary power of learning teams. In Michaelsen, L.K., Knight, A.B., and Fink, L.D. (Eds.), *Team-Based Learning: A Transformative Use of Small Groups* (pp. 3–26). Westport: Praeger Publishers,.

Freeman, M.A., (1995). Peer assessment by groups of group work. *Assessment and Evaluation in Higher Education*, *20*(3), 297–306.

Freeman, M.A., & McKenzie, J. (2002). SPARK: A Confidential Web-Based Template for Self and Peer Assessment of Student Teamwork: Benefits of Evaluating Across Different Subjects. *British Journal of Educational Technology*, *33*(5), 551–569.

Freeman, M., Huthinson, D., & Treleaven, L. (in press). *The importance of formative feedback in improving groupwork outcomes.* Paper presented at the National UniServe Conference, The University of Sydney, 27th–29th September 2006.

Goldfinch, J., & Raeside, R. (1990). Development of a peer assessment technique for obtaining individual marks on a group project. *Assessment and Evaluation in Higher Education*, *15*(3), 21–31.

Goldfinch, J. (1994). Further developments in peer assessment of group projects. *Assessment and Evaluation in Higher Education*, *19*(1), 29–35.

Hanrahan, S.J., & Isaacs, G. (2001). Assessing self- and peer-assessment: the students' views", *Higher Education Research and Development*, *20*(1), 53–70.

Higgins, R., Hartley, P., & Skelton, A. (2002). The conscientious consumer: reconsidering the role of assessment in student learning. *Studies in Higher Education*, *27*(1), 53–64.

Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate peripheral participation*. New Jersey: Cambridge University Press.

Leach, L., Neutze, G., & Zepke, N. (2001). Assessment and empowerment: some critical questions. *Assessment and Evaluation in Higher Education, 26*(4), 293–305.

Lejk, M., & Wyvill, M. (2001). The effect of inclusion of self-assessment with peer assessment of contributions to a group project: a quantitative study of secret and agreed assessments. *Assessment and Evaluation in Higher Education*, *26*(6), 551–562.

Luft, J. (1970,) *Group processes; an introduction to group dynamics* (2nd Ed.). Palo Alto, CA: National Press Books.

Michaelsen, L.K., Knight, A.B., & Fink, L.D. (Eds.) (2004). *Team-Based Learning: A Transformative Use of Small Groups*. Westport: Praeger Publishers.

O'Donovan, B., Price, M., & Rust, C. (2004). Know what I mean? Enhancing student understanding of assessment standards and criteria. *Teaching in Higher Education*, *9*(3), 145–158.

Ramsden, P. (2003). *Learning to teach in Higher Education*. (2nd ed). London: Routledge.

Rust, C., O'Donovan, B., & Price, M. (2005). A social constructivist assessment process model: how the research literature shows us this could be best practice. *Assessment & Evaluation in Higher Education*, *30*(3), 231–240.

Sadler, D. (1989). Formative assessment and the design of instructional systems. *Instructional Science, 18*, 145–165.

Scriven, M. (1967). The methodology of evaluation. In R. Tyler, R. Gagne & M. Scriven (Eds.), *Perspectives on Curriculum evaluation*. Chicago: Rand Macnally and Co.

Taylor, C. (1985). *Human Agency and Language: Philosophical papers* (Vol. 1). London: Cambridge University Press.

Taras, M. (2002). Using assessment for learning and learning for assessment. *Assessment & Evaluation in Higher Education, 27*(6), 501–510.

Taras, M. (2003). To feedback or not to feedback in student self-assessment. *Assessment & Evaluation in Higher Education, 28*(5), 549–565.
Taras, M. (2005). Assessment – summative and formative – some theoretical reflections. *British Journal of Educational Studies, 53*(4), 466–478.
Taras, M. (2006). Do unto others or not: equity in feedback for undergraduates. *Assessment & Evaluation in Higher Education, 31*(3), 365–377.
Tsoukas, H., & Vladimirou, E. (2001). What is Organisational Knowledge? *Journal of Management Studies, 38*(7), 973–993.
Vygotsky, L. S. (1962). *Thought and Language*. Cambridge, MA: MIT Press.
Vygotsky, L. S. (1978). *Mind in Society*. Cambridge, MA: Harvard University Press.
Watson, W.E., Kumar, K., & Michaelsen, L.K. (1993). Cultural diversity's impact on group process and performance: comparing culturally homogeneous and culturally diverse task groups. *Academy of Management Journal*, *36*(30), 590–602.

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Sharing open courseware content through learning objects standards

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A number of universities around the globe have decided to share their learning materials, making them available for use and modification by learners and other institutions. This initiative, started by the Massachusetts Institute of Technology (MIT), has opened up great opportunities for new ways of reusing content and for collaboration amongst teachers. It has also created new challenges, including the fact that there are thousands of courses available which cannot be easily modified by authoring tools or integrated into the courses managed by Learning Management Systems, due to the fact they are not in a standards compliant format. Regrettably, making them standards compliant is time-consuming and expensive, requiring a lot of effort from academics and institutions. This paper reports on a project to automatically structure learning materials and package them so they can be reused. We present a tool that produces IMS-CP compliant courses, with embedded metadata, in an automatic way by combining custom-built information extraction techniques and open e-leaning standards. Extensive testing was carried out on different learning object repositories.

Keywords: open courseware, e-learning, standards, metadata, content packaging, learning management systems, learning objects repositories

Introduction

The new trend of Open CourseWare (OCW), has been increasingly documented in the research literature (Baldi et al., 2002; Materu, 2004; Yue et al., 2004). It is an effort to share knowledge and make the best educational use of learning materials. Educators from around the world may share the content and the design of their courses, improving them through collaboration. Materu (2004) described how students may enhance their coursework or pursue self-study and how the general public may glimpse the depth and breadth of what leading universities are offering and benefit from reading lists and lectures.
The very first OCW project was carried out by Massachusetts Institute of Technology (MIT) in 2001. Since then, MIT (MIT OCW website, 2006) has published 1250 (Dec/2005) of its 1800 university courses. Most initial efforts have been of ‘converting’ (cloning) university face-to-face courses into ‘digital’ learning materials, and making them available to any educational institution, students and self-learners round the world. MIT’s OpenCourseware materials have been translated to German, Hindi, Mandarin and Spanish, and the translations made available. Universities around the globe have followed, and many more courses have been made available. Our project tries to use these valuable resources in new ways to support student learning. Other projects have used learning resources for extracting metadata (Sonntag, 2004) or for adaptive learning experiences, as in the ELCAT system (Clements & Xu, 2005). However, these projects haven’t made use of educational standards and/or the course data haven’t been placed in databases, making it hard to reuse in other contexts or in standard Learning Management Systems.

The most relevant characteristic of these projects is that the learning activities are ‘passive’, in the sense that students do not get to interact with teachers or other students. This is an important difference with distance learning initiatives and all these projects made clear that they do not replace face-to-face learning. Students are not assessed so these are not degree-granting activities and students do not get formal credits. All course materials are free of charge and users (individuals and institutions) can modify and distribute the content as long as they adhere to its copyright license. The Creative Commons license (Creative Commons website, 2006) is the most commonly used and provides a flexible licensing approach for creative works. It is an alternative to the totally restrictive "All Rights Reserved" copyright license, so it has become a legal mechanism for many organizations to contribute their work to the ‘commons’ while clearly stating on what conditions the work is distributed.

Our project aims at helping people and institutions get the most out of the many resources that are available under these (CC) licenses.

The OCW repositories contain courses with more or less the same structure: a syllabus, that describes the course, its aims and expected outcomes, a calendar and lecture notes. Few courses include multimedia resources such as audio files and PowerPoint presentations. These repositories are in many ways static, and since they cannot be easily integrated into systems where students can engage in discussions, or participate in activities, their learning potential is limited. In order to reuse the materials in innovative ways, the content must be integrated into an educationally sound design. But this has a number of technical challenges (Boyle, 2003).

The learning content needs to be converted to new standards-compliant formats as described later. But since this process is very time consuming even for a small number of courses, the conversion must be done automatically. OCW websites were built using standard templates but the structure they have is very coarse, probably because further structuring the content would require additional work by academics. What is more, each organization uses different template formatting (e.g. some courses contain two-dimension tables while many others use just a single paragraph). The materials are not labeled with the necessary metadata that describes the topic, level of difficulty or knowledge required. Due to these limitations, teachers cannot reuse, repurpose and/or search or easily import their courses into an LMS where they could add learning and assessment activities.

Today, the courseware provides the same curriculum structure and content to different learners despite individual differences such as knowledge background, learning style, learning speed, etc. In the future, these materials would be better used in learner-adapted environments.

To overcome the above problems, this article introduces a multidisciplinary approach to combine information extraction techniques with open educational standards, specifications and learning objects repositories and by doing so, contribute to the understanding on how these specifications are applied in real implementations, and hopefully provide a benchmarking collection of learning materials that helps:

- enhance reusability and interoperability of digital learning resources
- enrich learner’s online experiences
- teachers and instructional designers get the most of their actual learning materials or courses by adapting and personalizing content in a more efficient way; they can complement or supplement their local universities courses as well
- develop courses that are self-contained and can be shared easily.
- improve our ability to search and repurpose content.

Methodology

A number of technologies were used to download, parse and package the courses available at OCW websites. The MIT group coordinating OCW could have packaged the materials, but due to technical difficulties have not done it yet. Since the tool described here can be easily adapted to other similar repositories by changing the configuration files used by the parser, our approach is of a more general use. Our approach will allow non-OCW repositories to be packaged, distributed and reused in standard compliant formats.

OCW Spider, a custom-built Web crawler, was developed to download each course. A strategy was devised for gathering each part of a course, including all the attached resources, and building a new course structure in a reasonably efficient manner.

Tools were developed (e.g. a parser and a wrapper) to perform course structure analysis and extract details from each course such as: title, description, authors, and keywords among others. A wrapping tool was also developed, which produces a valid XML manifest file as output, ready to be uploaded into any IMS-CP (IMS Global Learning Consortium website, 2006) conformant LMS. This manifest file includes metadata as well.

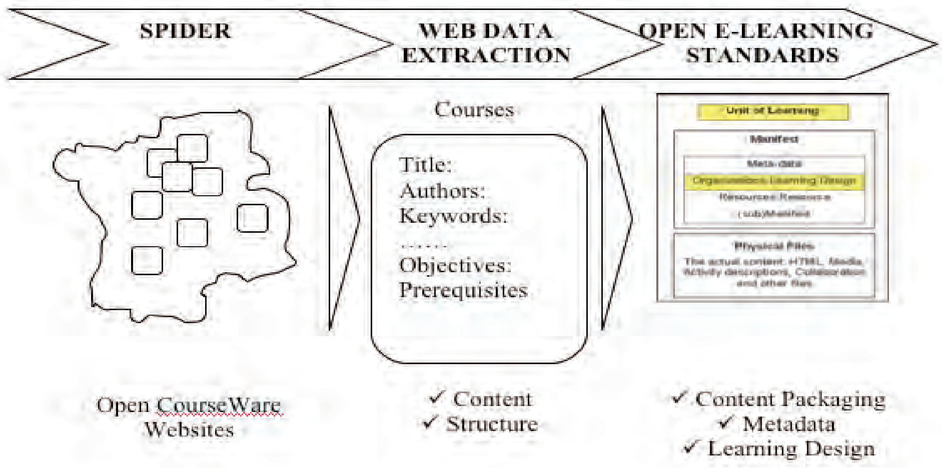

Figure 1: System implementation

Implementation design

Architecture

Figure 1 shows the system architecture of the proposed tool. The system consists of three modules: Spider, Parser and a Wrapper. These modules work as follows.

1 The Spider is in charge of downloading each course from the specified OCW website in an automatic way, including all the attached resources. It also creates a custom directory structure to hold each part of the course and where the rest of the process will take place.
2 Each course is then parsed in order to analyse each part of a course (e.g., syllabus, calendar, assignments, etc). Then, it extracts all available metadata (e.g., course title, authors, keywords, course size, discipline it belongs to, etc).
3 This module wraps up each part of the course producing an XML manifest file. Then all course resources such as: PowerPoint presentations, lectures (PDF files), audio files and so on are zipped together making this course a self-contained course.

We have used the Perl programming language, so our implementation is platform independent.

Conclusions

In this paper, we have outlined the motivations for sharing learning materials in order to promote the exchange of knowledge among teachers and learners. We have developed tools that can perform the task of automatic downloading, metadata extraction, parsing and standard compliant packaging of these materials.

We successfully processed 900 courses, about 4 GB of digital learning materials, of MIT OCW courses into an IMS-CP format. One of our evaluation criteria involved randomly choosing half of the total courses within each discipline (32 disciplines in total) and importing them in four different LORs in an attempt to evaluate and test our system implementation. Courses could be successfully imported, modified and then exported in the same format. This allows for a course (or part of it) to be reused.

Our three-step extraction process improves the reusability, interoperability and searchability of learning resources.

Some implementation issues have become apparent while running the modules. The most important one is the need for better information extraction techniques. Due to the fact that every OCW project has developed its own website structure and formatting styles, and our custom built extraction techniques were developed based on MIT OCW website, when applied to a different website, they don't perform in the same way without applying some minor changes to the configuration files. However, we still get reasonable accuracy in the extracted data.

We have combined different technologies in one by implementing a tool that makes use of Web Information Extraction (WIE), World Wide Web Perl libraries, open educational standards and Learning Objects Repositories Systems.

The work done so far could lead to further research and development work using the IMS Learning Design Standard, which allows sequencing of activities within classes or sessions as well as synchronous activities such as chat, brainstorming sessions, etc.

References

Baldi, S., Heier, H., & Stanzick, F. (2002). *Open Courseware vs. Open Source Software – a Critical Comparison*. 10th European Conference on Information Systems, 1375–1383.

Boyle, T. (2003). Design Principles for authoring dynamic, reusable learning objects. *Australasian Journal of Educational Technology*, 19(1), 46–58.

Clements, I., & Xu, Z. (2005). ELCAT: an e-learning content adaptation toolkit. *Campus-Wide Information Systems*, 22(2), 108–122.

Creative Commons website. http://creativecommons.org/ [viewed 10 Aug 2006]

IMS Global Learning Consortium. *IMS Content Packaging Best Practice and Implementation Guide* v1.1.4 [Electronic Version]. Inc. http://www.imsglobal.org/ [viewed 18 Sep 2006].

Materu, P. N. (2004). *Open Source Courseware: A Baseline Study* [Electronic Version]. The World Bank from http://www.worldbank.org/afr/teia/open-courseware.pdf.

MIT OpenCourseWare (OCW) website. http://ocw.mit.edu/index.html [viewed 18 Sep 2006].

Sonntag, M. (2004). *Metadata in E-Learning Applications: Automatic Extraction and Reuse*. Paper presented at the 12th Interdisciplinary Information Management Talks, Universitätsverlag Rudolf Trauner, Linz.

Yue, K.-B., Yang, T. A., Ding, W., & Chen, P. (2004). Open courseware and computer science education. *Journal of Computing Sciences in Colleges*, 20(1), 178–186.

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To post or not to post: Undergraduate student perceptions about participating in online discussions

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Computer mediated conferencing (CMC) is now a common feature of blended learning environments where students learn in both face to face and online settings. While many teachers recognize the value of online discussions for learning, students appear to have different perspectives. Consequently, their participation in online discussions is often sporadic and not genuinely interactive. This paper examines these issues and provides student perspectives about participation in online discussions which arose from a case study in a conceptually difficult subject. Systems data indicated low numbers of posted messages. Student interviews provide some insights into this lack of participation, and identify the influence of the curriculum design, especially the nature of the learning activity, and its connection to other aspects of the course, for example, assessment and the regular class sessions. Other influential factors include the student's ideas about learning, managing demands on their time and their acceptance of CMC. The paper also provides recommendations for improving participation in online discussions.

Keywords: CMC, blended learning, online discussions, participation

Introduction

Online discussions are now a common feature of university courses and have often been introduced by teachers because of their potential to improve learning outcomes, especially through their more active approaches (Harasim, Hiltz, Teles & Turoff, 1995). Teachers are currently investigating their most effective use, for example, Dysthe (2002) has discussed the way in which the online discussion texts can be used as a new thinking and dialogic device. The use of electronic technologies like online discussions would appear to fit well into the world of Net Genner students (Oblinger & Oblinger, 2005) who are digitally literate, highly mobile and connected and prolific communicators. Online discussions also offer flexibility to working students and a different and supportive communication environment for English as second language (ESL) students (Gerbic, 2005).

However the introduction of online discussions in campus based courses raises special challenges because students have expectations based on traditional learning paradigms and have difficulty understanding why online discussions are included within their courses and what the benefits might be (Armatas, Holt & Rice, 2003). Students often demonstrate their uncertainty by not contributing to the discussions, thus indicating a disjunction between teachers' intentions and practice concerning online discussions and student perspectives of this medium and its value for learning.

A continuous refrain in much of the literature, in both the distance and campus based contexts is the need for students to participate in order to get the benefits of online discussions and the difficulties in often doing so. This paper provides a contribution to this issue by presenting student perspectives on participation. It discusses a case study investigation in a compulsory law course that was technically difficult for students and was located in an business area to which they had difficulty relating. The dominant factor to emerge from the course setting was the small number of messages posted in the online discussion. The paper presents student perspectives on this issue and makes recommendations for practice based on these perspectives.

Participation in online discussions

Harasim et al. (1995) viewed participation in online discussions as a kind of 'attendance' which involved more than using a keyboard and mouse and also included social and cognitive engagement. In a synthesis of other works, Ho (2002; p.2) defined effective participation as occurring when:

> online communication facilitates, amongst learners, the development of a deep understanding of the material through sharing and critically evaluating one's own and others' ideas and where connections are made within the elements of the learning material or with independently sourced material, justified through research and analysis.

Participating in this form of social and text based interaction is a modern enactment of Vygotsky's idea of learning as a socio-cultural process where language is an essential vehicle for development. Duffy and Cunningham (1996) applied Vygotsky's ideas to the computer-mediated communication (CMC) context and regarded the potential for interaction and dialogue as one of the most attractive learning features of CMC. The text based format has been linked by Rourke and Anderson (2002; p.3) to reflection and higher order thinking, namely, "the act of encoding ideas in textual format and communicating them to others forces cognitive processing and a resulting clarity". The significance of dialogue and interaction has also been recognized in contemporary pedagogical models, for example, Laurillard's (2002) 'Conversational Framework', Salmon's (2000) five stage model for online learning and Garrison and Anderson's (2003) Community of Inquiry.

A review of the literature indicates that there are three broad levels of participation. **Firstly,** there is message reading or 'lurking' (Salmon, 2003) Salmon characterized lurkers in several ways: as freeloaders, who would not give anything in return; as sponges, who lacked confidence to make a contribution or as those with skills or access problems. However Guzdial and Carroll (2002) suggested that lurkers could be learning (1) vicariously, by reading the discussions and recognising their understanding in the postings of other students, or (2) by reflecting, even though they don't post, or (3) by including the online discussion ideas into their assignments and general learning. **Secondly**, participants may read and think about the messages, and then treat the online discussion as a notice board and post their own position, for example Pena-Shaff's 'reflective soliloquy' (2004; p.260). Earlier, Henri (1995) had commented that this kind of more limited interaction was still valuable because of its role in supporting individualised learning. **Thirdly**, there is participation which is interactive and dialogic, for example, Dysthe's (2002) multi vocal (as opposed to univocal) communication and it is at this level that the learning potential of CMC is most likely to be realized both in terms of collaborative learning but also individual understanding.

Factors affecting participation

Despite the important of participation for online discussions, it appears that little substantive research has been carried out into this topic. One significant study is that of Weaver (2005) who investigated participation in the distance context including the role of social presence. She found that the type of interaction required by the course affected student participation as well as their achievement and satisfaction and that social and collaborative interaction had a positive effect. Her research identified the main motivators for student participation which were interest in the course, being able to learn from others, desire for insight into assessment, getting opinions advice and responses from others, giving and receiving help, academic improvement, deeper exploration of concepts, summaries from moderators and the overcoming isolation through other students (2005). Weaver also identified demotivators which were access, technology and forum layout problems, time pressure, irrelevant discussion topics, long and/or meaningless messages, too many postings, non-participation by others, arrogant contributors, personal discussions and irrelevant chatter, fear of looking silly and lack of confidence (2005).

Other studies have identified various influential factors which have been classified in Table 1 below as arising from the CMC environment itself, the curriculum design and student issues about online discussion and learning.

Table 1: Factors affecting participation in online discussions

CMC Environment Factors	- access to technology at work or home - lack of familiarity with computers or the software - the size of the discussion group, with a preference for smaller groups - technical problems, but not typing skills - lack of participation which reduced the desire to participate and vice versa - the absence of spontaneous exchanges - too much information and most of it was trivial - expressing thoughts in text rather than speech was more cognitively demanding and took much longer - a belief that the written messages had to be formal and perfect - anxiety about posting messages due to their permanence
Curriculum factors	- whether the discussion topic itself was interesting - whether the online discussion was linked to assessment - whether the online discussions were voluntary - integration of the online discussions into the course - satisfaction with the current interaction - high overall course workloads - online discussion not part of the programme culture
Student factors	- familiarity with or amount of knowledge about the discussion subject - lacking confidence in their topic expertise - a preference for reading printed materials rather than the online discussions - competing demands from work and home and lack of time - the need for self motivation, and discipline - good time management with goal setting and prioritizing required - an extra workload for an uncertain return and benefits not clear - lack of commitment to online discussions - understanding the role and value of online discussions
References	Grint (1989), Boddy (1999), Hammond (1999), Salmon (2000), Zaferiou, (2001), Holley (2002), Fung (2004), Palloff and Pratt (2003)

There are particular issues regarding participation in online discussions by students enrolled in campus based courses. Collis and Moonen (2001) noted the conservatism of students when flexible learning was introduced and the influence of rumours about spending all day in front of computers, never having contact with teachers and the disappearance of lectures, all of which were untrue. One major challenge for teachers was addressing the deeply held belief by students that lectures were essential and fundamental and the best form of learning and computers would change this in a negative fashion. This kind of concern is the dominant view in the literature and also applies to CMC. In an evaluation of the introduction of online discussions into an MBA finance course, Walker and Arnold (2004) reported that while the potential value of computers for learning was generally endorsed, critics of the CMC experience (60% of their students) regarded the online discussions as "simply a change in medium in the exchange of ideas with the class – a strange and unfamiliar way of conducting the learning process" (2004; p.257).

The introduction of online discussions to face-to-face courses raises issues for students about their relevance and importance for learning, especially where they are voluntary. The senior undergraduate marketing students in Molesworth's (2004) study liked the flexibility of the (voluntary) online discussions, but 43% of them did not participate or did so superficially. Molesworth concluded that the main benefit of the online discussions was the "flexibility to ignore this mode of learning" (p.89). It is somewhat surprising that Net Genners are slow to acknowledge the role of ICT in learning. However, Aspden and Helm (2004) reported that UK campus based students, especially those who worked, had positive views about CMC and identified its value in maintaining their engagement with their courses and giving them more opportunities to reflect and discuss away from their face-to-face classes.

Student participation in online discussions is an essential precursor to any learning benefits which might be obtained from this medium. The literature indicates that not much is known about what motivates students to contribute, and the way in which factors like the course design or the CMC environment influence student behaviour. The recent introduction of CMC to campus based courses in business also means that participation issues in this context have not received much consideration. This paper provides some insights into these issues from a student perspective.

The research study

The research presented here was part of a wider investigation into the ways in which campus based undergraduate business students learn in online discussions in a blended environment (a mixture of face-to-face and online elements). The project took a learner perspective and focused on (1) the influence of the CMC environment, particularly writing, and peer interaction and (2) the influence of the curriculum design e.g. the learning activity, assessment. Participation was not specifically one of the aims of the study but emerged as a major theme in one of the case studies of the project.

Context

The research was sited within a law course in a business degree programme which was compulsory for students studying commercial law or wanting to meet professional accounting requirements. Law was regarded as a conceptually difficult subject, with its emphasis on the correct application of principles, supported by legal reasoning. The degree programme had a small class philosophy, so there were no large lectures, and instead, classes comprised 25- 30 students. The course was in flexible mode with a two hour face to face evening class each week followed by online discussions. The weekly classes were based on PowerPoint slides and were supported with a course handbook and a website which contained revision quizzes, articles, course materials and web sites links.

The teacher had inherited an existing course and was not highly familiar with its flexible mode. The online discussion activities are described below in Table 2.

Table 2: Online discussion activities

Each week, 2 -4 exercises were posted in the discussion forum as threads, and students were expected to do all of them. These were carefully scaffolded for difficulty and progressed from recall, to comprehension to more complex scenarios which required correct solutions, and precise use of the concepts and language. *Examples* *(1) Define the term "internal governance".* ***[recall]*** *(2) Why would the members of a company choose not to have a separate constitution? Why would they decide that it was necessary to have a separate constitution?* ***[comprehension]*** *(3) Lia and Dan wish to form Liandan Co Ltd to carry out a food retailing business. They ask you to prepare the necessary documentation. In discussion you ascertain the following: both Lia and Dan would like the internal governance rules to provide that each is entitled to be a director of the company and cannot be removed against their wishes. They would also like to include a provision that all business decisions involving expenditure of more than $10,000 must be agreed to by both directors. Can they do so?* ***[problem/scenarios]*** Students were also given Guidelines for Online Discussion – a page of generic tips on participating e.g. prompt replies, reading and responding, questioning, clarifying, providing a reference, examples etc. The teacher regularly discussed expectations in class, including the benefits of a running conversation on the exercises and encouraged students to participate in the online discussions Solutions to the exercises posted on the website, and generally comprised an outline of the main points.

Research design and methodology

A case study approach was chosen because of its ability to best achieve the research aims by providing thick rich description and new insights (Merriam, 1998) in a comparatively new area of research. Such an approach could provide findings that were grounded in reality, and supportive of an ‘ecological validity’ (Enwistle, 1997) approach, where theory was derived from the kind of context to which it would be applied in future. The case study design also supported the investigation the interrelationships between online discussions, the curriculum and face-to-face classes.

Multiple sources of data were included. Initially paper based and online course information was analysed to develop a description of the case setting. Content analysis of the online discussions was abandoned because only 31 postings were available for the semester and 15 of them came from one participant. Systems data regarding message reading and posting frequency and course and performance data were also analysed. The main source of data were interviews with the participants regarding their experiences and perspectives of the online discussions in this course and their relationship to their face-top-face classes. During the interviews, students had access to an archive of the online discussions via a laptop and this approach seemed to aid students' memories and enabled them to illustrate their points as well as creating a more relaxed atmosphere. Transcripts of the interviews were imported into NVivo where they were coded and then analysed in an inductive fashion for themes and patterns. Several layers of analysis followed which incorporated perspectives from the other data and developed some overall findings.

Seven students (25% of the class) agreed to participate in this case study, and they are described below in Table 3.

Table 3: Participant descriptor (using pseudonyms)

	Ethnicity	Grade	Age	Major	Online learning experience	Online discussion experience	Work	Full or part time study
Lucy	NZ	B	25-30	Acc	1-2 papers	No	> 10 hours	PT
Alexa	NA	C	20-24	Law	3+ papers	Occasionally	> 10 hours	FT
Jane	NZ	A	31-34	Law	3+ papers	Occasionally	FT	PT
Paul	NZ	B	20-24	Acc	1-2 papers	Occasionally	FT	FT
Cath	Chinese	C	<40	Acc	3+ papers	No	No	FT
Emma	Chinese	C	<40	Acc	1-2 papers	Often	No	PT
Sandra	Chinese	C	20-24	Acc	3+ papers	Occasionally	No	FT

Six of the participants were female and all the participants were working or had worked before, or had family responsibilities. Three of the participants were Chinese and English as second language (ESL) speakers. Only one student had significant experience in online discussions and two of them had no experience. One of the participants obtained the highest grade for the course and the overall performance for the other participants was lower than that of the class overall.

Results

Systems data

Despite active teacher messaging, the overall picture that quickly emerged was one of low levels of posting by the participants, which was also reflected in whole class activity. The postings were evenly spread across the three different kinds of exercises (recall, comprehension and problems) with a maximum of ten postings for any individual exercise and half of the exercises having one to three postings. The participants posted fewer messages than the class average (Five messages per participant versus six messages per student in the class). One of participants, Sandra did not make any postings. Lucy made the most postings comprising 15 messages over six weeks. The other five participants, Alexa, Jane, Paul, Cath and Emma, operated minimally and made one to six postings over one to three weeks of the course. The overall character of the message activity was that of placing on a noticeboard and dialogue and interaction were rare.

Interviews

The interviews were analysed and scrutinised for differences between the three different levels of participation (none [Sandra], minimal [Alexa, Jane, Paul, Cath and Emma] and the most [Lucy]), however, these were minimal.

Views of learning and knowledge
All of the students had quite pragmatic views about knowledge and saw it as a mixture of conceptual understanding and developing skills for their careers in accounting. All of them liked to learn in a structured, teacher led classroom and only Jane and Paul liked and recognised the value of discussions for learning. Cath, Emma and Sandra all regarded the teacher as the expert and someone who could give them rapid feedback and help them to understand the subject.

CMC environment
In this course, the main benefits of the online discussions were associated with reading the messages, which the participants said enabled them to check their own understandings. Emma said:

> …at first I was confused… Then I watched other students discussing and their opinions so that I could understand.

This included Sandra, who did not post at all, who said that every week, she mapped out the answers in her head and then looked at the postings, especially if the topic was a difficult one. Despite their low levels of message posting, all of the students, except Paul, could describe the benefits of writing their postings and these included embedding understanding, clarifying ideas and using the technical language and concepts correctly. Lucy, Alex, Jane and Paul all preferred the face-to-face environment for discussions and disliked the online environment because there was no immediacy or flow. However, Emma and Cath (both ESL students) both preferred online discussions because they could participate and interact more easily than in a face-to-face environment. For them, reading and writing messages was easier than listening and talking in class and its asynchronous nature meant that they had time to think about the postings and their response. Also, the virtual environment meant that the focus was on the topic rather than their identity, as Cath described:

> I don't have to think about what the student is male or female, happy or unhappy, or personally talkative or less talkative person or maybe he is personality difference…I can just put my opinion…. No worry about actions…or do you like Chinese or not. You don't worry about him. We are discussing topic, not each social difference, personality difference.

The curriculum
Everyone gave the same reason for not participating and that was the fact that the online discussions were not assessed or required for the course. Some of the students thought it was unfair that people could read their contributions without posting themselves and everyone knew that the exercise 'solutions' were available on the website. All of the students, except Lucy (who was not working and enrolled in only two papers), described being under considerable pressure of time as they tried to balance their study with their work and family commitments and in their prioritising, the voluntary nature of the online discussions always gave way to more pressing demands. Emma said:

> we are busy, busy, busy so we just do what is urgent or important.

This was despite the fact that the course had been redesigned to reduce face-to-face contact time and workload and create a space for the online discussions.

The other reason that emerged for low participation was the nature of the online discussion activities. While the discussions activities had been carefully designed to scaffold learning, the students regarded them as uninteresting because they mostly had a single correct answer. Paul described this as regurgitation from the textbook:

> Instead of you going away and having to think about it…you could just take a paragraph straight out of the textbook.

Jane saw it as homework posted onto a noticeboard:

> Because there's a question, you go and research it and you respond and that's it…homeworks done… I don't… necessarily read what other people have written, because

> everybody just answers with the same response. So its not really a sharing of ideas, its really an answer to a question… the only reason I read other people's was to help me put my own together.

Cath and Lucy (the best contributor with the most time) felt de-motivated because it meant that very soon after the discussions started, there were no new points to make:

> So, there's not really much else to add. And … then you kind of, I don't know, always feel a bit useless after, you know, having to say…everyone else has already answered, you know, said what I want to say.

Alexa did not like the online discussions because, owing to the nature of the subject, she could not draw on her experience and they were too complicated. Analysis of the discussion exercises indicated that one third of them involved recall and comprehension of fundamentals and the balance of them were based on technically right or wrong concepts with little room for different opinions.

All of the students, except Alexa, could describe a good discussion activity. Business or accounting problems were widely identified and Lucy and Paul stressed the importance of contemporary and substantial issues that required thought, interpretation and application of the course concepts. Another important discussion characteristic was that of multiple viewpoints, with room for sharing ideas, and agreement and disagreement. Paul and Sandra wanted discussions that were well linked to the face-to-face classes and suggested that group, instead of whole class activities would encourage more participation.

The teacher was very active in the online discussions and the feedback and extra comments that were provided were much appreciated by the students. However, despite the general preference of the participants for teacher led activity, this teacher's activity was insufficient to prompt participation in the face of time pressures and the voluntary nature of the discussions.

Relationship to the face-to-face classes
For the participants, there was little sense of connection between the online discussions and the face-to-face classes. The topic covered in class was recognised as the basis for the discussion exercises but this was insufficient to create strong linkages for everyone. The students acknowledged that in the face-to-face classes, the teacher explained the role of the online discussions and her expectations and regularly encouraged them to participate. However for the students, there was no sense of connection to the online discussions or, alternatively from the online discussions back into the classroom. Sandra and Paul saw the online discussions as quite separate from class – Sandra, because they were voluntary and offered no new course material and Paul, because while they were a form of homework, they were never discussed in class as was the case with homework. Lucy and Alexa both regarded the online discussions as a reiteration or review of the weekly class and for Jane, they had a strategic value in that they indicated what knowledge was important in the course. One complicating factor might have been the relative newness of online discussions for both the teacher and the participants. Jane and Paul were unclear about how they helped students to learn. Cath regarded the class sessions as fundamental in the sense that all the content and material came from them so there was no learning value in the online discussions.

Discussion

The main reasons to emerge for lack of participation arose from features of the curriculum design, followed by those relating to student perceptions of the CMC environment and their ideas about learning. These are discussed next and then followed with some recommendations for improving participation.

The curriculum

The most influential factor for participation was assessment and this finding is widely echoed in the literature, for example, Ramsden (2003) and Laurillard (2002) who have both stated that generally, students perceive that what is valued is that which is assessed. O'Reilly and Newton (2002) noted the trend in the literature for credit or marks to be given to ensure participation in online discussions and the close association with time demands as well. If online discussions are not assessed, then students must perceive their value in some other way. O'Reilly and Newton's (2002) study identified other values as social support, learning support and benchmarking with peers; however their study investigated distance students and these benefits might not be so attractive to campus based students.

The other reason that emerged for non participation was the nature of the discussion activities. While the teacher's intention was to scaffold the discussion activities to support learning, these activities were perceived as uninteresting by the participants because they were incapable of supporting a genuine discussion. In her investigation of online discussions, Dysthe (2002) found high levels of interactivity in the absence of a participation requirement or any marks for the activity and attributed this to an authentic discussion task, on a real world topic, with no right or wrong answers and lots of positions to provide different viewpoints and stimulate dialogue. The teacher stayed out of the online discussion and Dysthe (2002) argued that this resulted in symmetry between the participants which fostered dialogue, there being no reliance on the teacher or influence of the teacher's statements on communication. Her students were postgraduate students and in an undergraduate context, where students must understand a highly abstract body of knowledge and develop interpretation and reasoning skills, such interaction may be more difficult. There are also challenges in using real world problems and scenarios because many students have no personal experience of the discipline area. It may be that, in 'hard' subjects such as this one, online discussions have less value at a beginner's level and other learning activities, for example, multimedia based gaming and simulations may be more motivational for students.

The students could not see how the online discussions connected to their class and it is important to address this because of the central role of the classroom in traditional campus based teaching. The student always prioritised attendance at class even though it was voluntary and it may be that, along with assessment, the real curriculum lies in the classroom with the teacher. The need to integrate new media with all aspects of a course has been identified by Laurillard (2002) who argued that ICT must be fully integrated with other aspects of the course, otherwise it will remain on the margins of the student's perception of the learning context. This requirement has been applied to campus based settings by Walker and Arnold (2004) and Aspden and Holm (2004) who have identified the need for online discussions to complement the classroom or add value to it in some way and Lamy and Hassan (2004) also stressed the need for online discussion activities to be fully integrated with class activities so that they aren't seen as "disassociated".

The CMC environment

With the exception of the ESL students, there were no features of the CMC environment that were motivational for the participants. Learning benefits were therefore minimal and were limited to the students reading the postings, checking their own understandings and some possible further reflection. While reading and reflecting on messages is helpful for learning, as Guzdial and Carroll (2002) have indicated, it is important that students move beyond this reading and watching stage to realize the learning value of CMC. The postings that were made were examples of Henri's (1995) individual development rather than any collective construction of knowledge that may arise from interaction. In a subject that is conceptually difficult for students and somewhat removed from their reality, there could be considerable learning benefits in articulating and interpreting course concepts, especially for marginal students. The ESL students' recognition of the worth of the CMC environment identified a potential value for this medium and has been discussed elsewhere (Gerbic, 2005).

Recommendations

The findings of this case study suggest the following factors for practitioners to consider if they wish to improve participation and especially to move beyond lurking. They can be applied in all kinds of subjects but have arisen in the context of a subject which students perceive as difficult and/or those disciplines which are not naturally discursive because their content is based on correct or incorrect application of material. Overall, the recommendations attempt to apply Entwistle and Ramsden's (1983) concept of student responsiveness to learning activities based on their perceptions of the learning environment.

(a) Assess the online discussion

Students value what is assessed Ramsden (2003), so one way to claim students' attention and priority for online discussions is to either allocate grades for the activity or include it as a requirement for the course. Research by Bures, Abrami and Amundsen (2000) found that where online discussions were worth 10% or less of a participation mark there was less participation than a course where specific activities were graded and worth 20% or more of the final mark. Some practitioners and writers (for example, Ottewill, 2003) regard this as undesirable because it supports an instrumental approach to learning. However, while this may be true, it doesn't help students to learn (Biggs, 2003), and a better approach is to consider how to engage students with the course. Assessment can operate designed to provide learning opportunities as well as measurement performance (Boud, 1995).

(b) Align the online discussions to face-to-face classes

This needs to happen at two levels. Firstly, in a pragmatic sense, the online discussions need to be linked, complementary and woven into the fabric of the course (Walker & Arnold, 2004). Often, the class will provide a foundation for the online discussion in some way, but the online discussion can also be taken back into the class. This might occur through the teacher giving feedback on the postings, basing a class activity on the online discussion, or students making a class presentation based on a critique or summary of the online discussion. Secondly, in a more philosophical sense, the online discussions need to be matched by a similar learning philosophy in class (Vardi & Bunker, 2001). This might occur through the inclusion of small group activities where the emphasis is on learning through interaction rather than learning by teacher led activity and lectures.

(c) The activity must be genuinely discursive

Students are motivated by the opportunity to share views, read multiple viewpoints and contest and debate ideas and positions. Discursive activities are more likely to move students from relatively passive stances, such as reading postings, to more active roles like establishing their own understandings and viewpoint through posting a message (Dysthe, 2002). The research literature provides many exemplars of how this might occur ranging from relatively unstructured discussions involving substantive questions, through to more structured debates, cases and problems. In a subject that is conceptually difficult, students who do not understand the basic concepts of the course may not participate in the discussion (personal communication with teacher), so various scaffolding exercises and feedback might be required before the online discussion.

(d) Prepare students for learning through interaction and dialogue

Not all students have experienced the dialogue and interaction which is the basis of online discussions. Where students are only familiar with didactic approaches, they will often have no confidence in activities which involve learning with other students. This may be heightened in conceptually difficult subjects, and hence the importance of other scaffolding devices to ameliorate this. If students can see the value of collaborative learning then they may move from online monologues to more dialogic activity. This may require explicit discussion and modeling by the teacher of the process of developing ideas by responding to other postings rather than simply stating one's own thoughts. The value of small groups in this context is recognized, for example, Stacey (1999). Small group rather than whole class discussions may assist the development of true dialogic activity, by creating a community of learners who are sufficiently comfortable with each other to introduce some elements of dissonance into the discussion. Where the course material is difficult, then small groups could also be beneficial in creating an environment where making mistakes is not embarrassing.

(e) The role of the teacher

Because online discussions represent a huge change in the learning process for campus based students, it is essential that teachers explain to students their role in learning and achieving the learning outcomes of the course. Another issue for teachers is their role in the online discussions. Teacher presence can be beneficial through direct interaction and feedback to students. However, if the teacher is not participating in the online discussion, then this may create a space where students are responsible for discussions and this may result in more dialogic activity (Dysthe, 2002). Feedback to students can still be provided by the teacher in class. Various factors will influence this decision, for example, the course outcomes, the student profile, but the most significant factor is likely to be teachers' philosophies of learning.

Conclusion

This paper has presented student perspectives on online discussions when they were included in a campus based course. The most influential factor for students' online participation in this conceptually difficult subject was the curriculum design. This case study reflects a broader general trend where voluntary, as opposed to required or assessed activities are not prioritised by students. The case also indicated that the nature of the online discussion activity itself is critical for participation and in the absence of a requirement, students will not contribute to online discussions which are not genuinely discursive and a good fit with the interactive nature of the CMC medium. Watching discussions through lurking and being able to check one's own understanding may have some value, however, to maximise the benefits of the CMC medium, students need to participate by thinking and writing about their understanding, and engaging in dialogic interaction, that is the highest degree of participation. This case suggests that for on campus students, participation in online discussions is more likely to occur if they are well integrated with the face-to-face class and complements or add value to that class. This is somewhat dependent on the teacher's beliefs about learning.

Dysthe (2002) points out that using other people's writing or texts as a basis for thinking is new for many teachers and students and it is therefore important to develop an awareness of the way in which this process contributes to learning. Learning in this fashion raises issues about the legitimacy of online discussions as a valid form of learning. Two changes in perspective are needed; one which recognises the value of peer discussions in learning and another which involves recognition of virtual learning spaces as complementary to the traditional face-to-face environment. Both of these require thinking about new ways of learning and change from students – and teachers.

References

Armatas, C., Holt, D., & Rice, M. (2003). Impacts of an online-supported resources-based learning environment: Does one size fit all? *Distance Education, 24*(2), 141-158.

Aspden, L., & Helm, P. (2004). Making the connection in a blended learning environment. *Educational Technology Research and Development, 41*(3), 245-252.

Biggs, J. (2003). *Teaching for quality learning at university* (2nd ed.). Berkshire: Open University Press.

Boddy, D. (1999). Barriers to electronic networking: Technology, student needs or social context. *Active Learning, 10*(July), 39-43.

Boud, D. (1995). Assessment and learning: Complimentary or contradictory? In P. Knight (Ed.),
Assessment for Learning in Higher Education. (pp. 35-48). London: Kogan Page.

Bures, E., Abrami, P., & Amundsen, C. (2000). Student motivation to learn via computer conferencing. *Research in Higher Education, 41*(5), 593- 621.

Collis, B., & Moonen, J. (2001). *Flexible learning in a digital world*. London: Kogan Page.

Duffy, T., & Cunningham, D. (1996). Constructivism: Implications for the Design and Delivery of Instruction. In D. Jonassen (Ed.), *Handbook of Research for Educational Communications and Technology.* (pp. 170-198). New York: Simon & Schuster.

Dysthe, O. (2002). The learning potential of a web-mediated discussion in a university course. *Studies in Higher Education, 27*(3), 339- 352.

Entwistle, N. (1997). Contrasting perspectives on learning. In F. Marton, D. Hounsell & N. Entwistle (Eds.), *The experience of learning* (2nd ed.). Edinburgh: Scottish Academic Press.

Entwistle, N., & Ramsden, P. (1983). *Understanding student learning*. Kent: Croom Helm Ltd.

Fung, Y. (2004). Collaborative online learning. *Open Learning, 19*(2), 135-149.

Garrison, D., & Anderson , T. (2003). *E-Learning in the 21st century. A framework for research and practice*. London: Routledge Falmer.

Gerbic, P. (2005). *Chinese Learners and computer mediated communication: Balancing culture, technology and pedagogy.* Presented at Balance, Fidelity, Mobility: Maintaining Momentum, in proceedings of the 22nd annual conference of the Australasian Society of Computers in Learning in Tertiary Education, Brisbane, Australia.

Grint, K. (1989). Accounting for failure: participation and non-participation in CMC. In R. Mason & A. Kaye (Eds.), *Mindweave: Communication, computers and distance education*. Oxford: Pergamon Press.

Guzdial, M., & Carroll, K. (2002). *Explaining the lack of dialogue in computer-supported collaborative learning.* Paper presented at the Computer Supported Collaborative Learning Conference, CSCL 2002. http://newmedia.colorado.edu/cscl/18.html [viewed 24 September 2003]

Hammond, M. (1999). Issues associated with participation in on line forums - The case of the communicative learner. *Education and Information Technologies, 4*(4), 353-367.

Harasim, L., Hiltz, R., Teles, L., & Turoff, M. (1995). *Learning networks: A field guide to teaching and learning on line*. Cambridge: MIT Press.

Henri, F. (1995). Distance learning and computer-mediated communication: Interactive, quasi-interactive or monologue? In C. O.Malley (Ed.), *Computer Supported Collaborative learning.* (pp. 145-161). Berlin: Springer Verlag.

Ho, S. (2002). *Evaluating students' participation in on-line discussions.* Paper presented at the Australian World Wide Web Conference (AUSWEB), Sunshine Coast, Queensland, Australia http://ausweb.edu.au/aw02/papers/refereed/ho/paper.html [viewed 23/05/05]

Holley, D. (2002). "Which room is the virtual seminar in please?" *Education + Training, 44*(3), 112-121.

Lamy, M., & Hassan, X. (2003). What influences reflective interaction in distance peer learning? Evidence from four long-term online learners of French. *Open Learning, 18*(1), 39-59.

Laurillard, D. (2002). *Rethinking university teaching: a framework for the effective use of learning technologies* (2nd ed.). London and New York: Routledge.

Merriam, S. (1998). *Qualitative research and case study applications in education*. San Fransisco: Jossey-Bass.

Molesworth, M. (2004). Collaboration, reflection and selective neglect: Campus-based marketing students' experiences of using a virtual learning environment. *Innovations in Education and Training International, 41*(1), 79-92.

Oblinger, D., & Oblinger, J. (2005). Is it age or IT: First steps towards understanding the net generation. In D. Oblinger & J. Oblinger (Eds.), *Educating the net generation*. Boulder: Educause.

O'Reilly, M., & Newton, B. (2002). Interaction online: Above and beyond requirements of assessment. *AJET, 18*(1), 57-70.

Ottewill, R. (2003). What's wrong with instrumental learning? The case of business and management. *Education and Training, 45*(4), 189-196.

Rourke, L., & Anderson, T. (2002). Using peer teams to lead online discussions. *Journal of Interactive Media in Education, 1*, 1 - 21.

Pallof, R., & Pratt, K. (2003). *The virtual student: A profile and guide to working with on line learners.* San Francisco: Jossey-Bass.

Pena-Shaff, J., & Nicholls, C. (2004). Analyzing computer interactions and meaning construction in computer bulletin board discussions. *Computers and Education, 42*(3), 243-265.

Ramsden, P. (2003). *Learning to teach in higher education* (2nd ed.). London: RoutledgeFalmer.

Salmon, G. (2000). *E-Moderating: The key to teaching and learning online.* London: Kogan Page.

Salmon, G. (2003). *E-tivities: The key to active online learning*. London: Kogan Page.

Stacey, E. (1999). Collaborative learning in an online environment. *Canadian Journal of Distance Education, 14*(2), 14-33.

Vardi, I., & Bunker, A. (2001). *The relationship between the perceived value of supplementary online components, and student roles and responsibilities.* Paper presented at the Meeting at the Crossroads. Proceedings of the 18th Annual Conference of the Australasian society for Computers in Learning in Tertiary Education (ascilite), Melbourne, Australia.

Walker, R., & Arnold, I. (2004). Introducing group-based asynchronous learning to business education: Reflections on effective course design and delivery. *Educational Media International, 41*(3), 253-265.

Weaver, C. (2005). *What encourages student participation in online discussions?* Unpublished PhD thesis, University of Southern Queensland, Towomba, Australia.

Zafeirou, G., Nunes, J., & Ford, N. (2001). Using students' perceptions of participation in collaborative learning activities in designing online learning environments. *Education for Information, 19*, 83-106.

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Prototyping a wholly online IT unit

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One of the objectives of prototyping is to assess the reactions of users to a proposed system. Reactions are gathered through feedback which then influences the way a final system is designed. This paper reports on a face-to-face undergraduate unit that was converted to online mode (the prototype) in an attempt to provide feedback about an innovative problem-based learning approach for a new unit. The feedback from students through three online surveys was positive overall. The student feedback and the lessons learned by teaching staff through interaction with the prototype suggested how the design and development of the new unit should proceed.

Keywords: prototyping, IT curriculum, online learning, problem based learning

Introduction

In 2006 a new wholly online core unit, *IT Practice*, was introduced to third-year students studying information technology (IT) at Deakin University. The objectives of the unit are to give students exposure to professional IT practices and prepare them for the workplace.

The framework for *IT Practice* was developed during 2004. The framework has an underlying problem-based learning pedagogy (PBL) using a simulated organisation as a case study. The approach proposed in the framework is innovative. Before developing the final unit, a prototype was built to establish the feasibility of the approach and to allow the eventual users of the system to test it out. Prototyping is an activity that is used in the IT industry to enable users to take an active role in designing a new system. The prototype was a project management unit that was about to be phased out with the introduction of the new unit. Some of the 'content' of the project management unit would be used in *IT Practice*. The project management unit was thus converted to online mode and aspects of PBL were included in the implementation. Pragmatic choices were made about what could and should be set up in the prototype in the time available. Feedback was gathered from two groups of stakeholders – students and teaching staff.

Background

A new Bachelor of Information Technology degree was introduced at Deakin University in 2004. All of the new units were phased in over a three-year period, and in 2006 all final-year units were offered for the first time. *IT Practice* is one of the core third-year units. The learning objectives of the unit are that students will have knowledge of technical practices within the IT industry; have an understanding of the ethical behaviours and social responsibility required of IT professionals; they will have put into practice knowledge acquired over their previous IT studies; and they will have extended their critical thinking and communication skills. A number of different student cohorts study the unit – students from two campuses; students studying in off-campus mode; and international students studying locally as well as from institutions located overseas.

IT Practice has been mandated to be delivered wholly online. Wholly online means that there are no face-to-face classes and all teaching normally takes place via the Deakin online learning environment, known as Deakin Studies Online (DSO), supported via WebCT Vista.

Problem-based learning (PBL) was deemed to be an appropriate underlying pedagogy for teaching the unit. The goal of PBL is to provide practice in solving ill-structured problems with new knowledge being learned in the process of solving the problem. As they work through solutions in small groups, students improve problem-solving skills, teamwork, communication and leadership skills.

The characteristics of PBL are as follows:

- ‘real-life’ problems to engage the student in the learning process
- course material crosses traditional course material
- students collaborate in small groups
- the teacher’s role is as a facilitator of learning, not as an imparter of knowledge
- resources are available to assist in solving the problem but information on how to develop the solution is not provided.

PBL also has characteristics corresponding to those of the computing industry: i.e. computing is problem driven; life-long learning is required because of the continually changing nature of the industry; the project group is the main mode of operation; and it overlaps the boundaries of other disciplines (Ellis et al., 1998). PBL approaches have been used for teaching computing and information technology in Australia (see for example Duke et al., 1997; Greening et al., 1997) but the implementation in online computing or information technology education appears to be limited. There are added problems with conducting PBL online – ‘problems arise when the PBL method is applied in virtual learning environments where participants are distributed and weak communication channels make group interactions difficult’ (Miao et al., 2000, p. 232). According to Lee and Kim (2005), ‘it is important to provide a powerful artifact-mediated and society aware virtual learning environment for geographically distributed people to conduct PBL effectively’ (Lee & Kim, 2005, p. 291).

Creation of the prototype

The conceptual model

The pedagogical approach for *IT Practice* uses a PBL framework with an emphasis on experiential and authentic learning to gain insight into organisational practice and professional issues. The justification for the pedagogical framework has been described elsewhere (Goold, 2004).

The framework or the conceptual model consists of a number of elements. One element is the creation of a fictitious organisation, United Enterprises (UE) that simulates an organisation in the real world. UE consists of two components: resources and employees (staff). The resources are essentially any artefact that the company creates or stores as organisational knowledge. For IT students the emphasis is on documentation about users and customers; information systems documentation and software; and other information about organisational procedures, standards and related functions such as training. The UE employees have roles to play within the organisation. These roles are acted out by teaching staff (tutors). Typical positions in UE are project manager, legal advisor, help desk operator, quality assurance manager and business section managers. Students work in virtual teams, as members of the IT department to solve problems for UE. They communicate with other UE employees when they need assistance. The UE employees provide this assistance by giving support (scaffolding) for students to solve the tasks. The teaching staff administer the unit and its delivery, and create the resources within UE and the appropriate PBL assessment.

All of the problems are applied in the United Enterprises context. They are scenario based to simulate real life as much as possible. The problems are open-ended requiring investigation, analysis and critical thinking. Collaboration and communication are key elements in the model. This type of environment provides authentic learning and encourages active student engagement – ‘environments where experiential knowledge is learned through dialogue and interaction day-to-day’ (Vat, 2004, p. 138).

Converting the conceptual model into a prototype

Several possible environments were considered as suitable for the implementation of UE and the conceptual model. The first option was to situate UE within DSO. A second option was to create UE resources on CD-ROM and to use WebCT to link to the resources and provide the communication and collaboration tools. Neither option was considered to be suitable. Students see DSO as a learning environment where unit materials are made available for downloading and where communication takes place with teaching staff. UE needed to be an authentic workplace that modelled the real world. Consequently the third option, which was subsequently adopted, was to create UE as a website that simulated an organisational intranet. This website would not only be a repository of static resources but would also be an environment where virtual teams could collaborate and communicate and where communication among all UE staff could be easily facilitated.

The open source content management system Drupal (http://drupal.org) was chosen for creating the website. While it provided adequate content management tools, the communication facilities within it were excellent and particularly suitable for the tasks to be carried out within the organisation. These included the facility for learners to participate in groups through discussion boards as well as the ability to post items in a blog-like fashion that could then be commented on by others. Features such as email notification and the facility for individuals to subscribe to groups are available. According to Farmer (2004) the ability for learners to subscribe to communication within a learning environment is related to the perceived success of that environment.

Drupal also offered a simplistic modular based configuration which, given the timeframe and scope of the task, was of significant value to the unit team. This configuration allowed for the simple installation of features and provided the unit team with a range of opportunities to flexibly design and further develop the system while it was in operation. For example, extra pages of information could be created quickly and incorrect registrations could be quickly erased.

Overall, while there are more suitable tools for the development of a fully authentic virtual website, Drupal was chosen due to the nature of the tasks to be completed and the ease of use of the software. While a more authentic website system would offer greater levels of authentication, control and administration, it would be unlikely to offer the same degree of flexibility and functionality in terms of communication. Further, given the relative lack of expertise of the unit team in the coding and development of complex content management systems, it was important to have a system that could be administered with relative ease.

Converting to online

The format for the old project management unit followed a traditional on campus mode of delivery. There were two lectures per week; a tutorial class, where concepts and tools discussed in the lectures were applied; and a practical class where exercises using Microsoft Project and Excel were completed. Assessment was a formal exam at the end of semester (50%) and three assignments (50%). There were thus restrictions on what could be done regarding curriculum in the prototype. Students were still required to use project management tools and techniques and assessment could not be varied. Rational selections were made about content for the prototype and the types of PBL tasks, so that the focus of the unit would not be compromised.

The prototype was set up with three topics:

1 People and Project Management
2 Tools and Techniques
3 Planning and Managing IT Projects

Throughout the semester students worked in online groups of six or seven. The three topics were assessed by assignment work in line with the previous version of the course. For Topics 1 and 3 students used the United Enterprises website. Topic 2 addressed the core functions of scope, time, cost and quality. Resources and activities for each of these core functions were set up in a structured way. Neither UE nor the PBL approach was used for Topic 2, although students still worked in groups to complete the tasks.

The PBL tasks: Topic 1 and Topic 3
Topic 1 People and Project Management consisted of a ‘get-to-know-you’ activity, resources related to HR management and teamwork and a group assignment. In the assignment students were asked to select an appropriate project team for a project (scenario) for United Enterprises. Biographies for eight

Information Technology Services staff were available on the UE intranet. Information about one of the UE staff members is shown in Figure 1. Group discussion about suitable members for the project team took place in DSO.

Figure 1: One of the ITS Staff in UE

Topic 3 Planning and Managing IT Projects involved the creation of a project plan for a Staff Portal project. All details about the project were available in the UE website. The interface showing the introduction to the Topic 3 assignment is shown in Figure 2. Students had to subscribe to their groups within UE and they worked within UE, using discussion forums and submitting work. Two people at UE were available to answer questions about the project – Bill, the manager of the Project Office and Pat, the Project Manager.

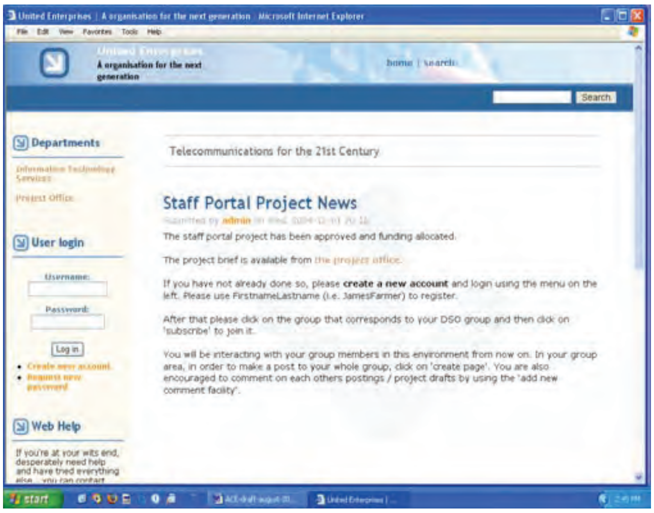


Figure 2: Information about the UE project

Evaluation of the prototype

The evaluation of the prototype occurred in two ways:

- reactions of students through feedback given by online surveys
- observations and lessons learned from the teaching staff.

Student evaluations

At the completion of the assessment for each of the topics an online survey was administered (in Weeks 4, 9 and 13 of the 13-week semester). The surveys were voluntary and anonymous. Students were asked to evaluate the learning materials and to provide information about the resources they had used. They were also asked to provide details about the amount of work they had done on each topic and to provide information about working in groups both face-to-face and online. Most questions required a *Likert* response, though a few questions were open ended requiring further comment. Students also provided demographic information about their gender, age, their course major and whether or not they were an international student.

Table 1 shows the surveys that were conducted and the types of tasks that were assessed for the topics. The total number of students who were enrolled at the date of each survey and the total number who responded are also shown.

Table 1: Survey and participation data

No	No. of questions	Task type	Students enrolled	Completed surveys	Response rate
1	22	PBL UE (static)	146	64	44%
2	39	No PBL used	141	52	37%
3	37	PBL UE (dynamic)	138	50	36%

The surveys conducted for Topics 1 and 3 were specifically designed to evaluate the PBL framework and to provide feedback about United Enterprises. The survey used for Topic 2 was not related to evaluation of the prototype. This survey was used primarily to gauge student perceptions of virtual team work and their experiences of online learning. The results of this survey have been reported elsewhere (Goold, Augar & Farmer, 2006).

Feedback from staff

The Unit Chair and three tutors were involved in teaching the prototype unit. An educational developer created the United Enterprises website and provided ongoing technical support throughout the semester. Tutors were given instruction (training) about the new approach and a 'Tutors Only' discussion forum was used to communicate and discuss teaching issues during the semester.

In Topics 1 and 2 the tutors were responsible for the group discussion forums in DSO. Each group consisted of six or seven students, and tutors provided some assistance with tasks and acted as mentors for the group. In Topic 3 two of the tutors had designated roles (Pat and Bill) within UE. Students worked within the UE environment and they asked for help from Pat and Bill.

During the semester the tutors reported on what they observed as students interacted with UE. They also made recommendations about future improvements for the UE website.

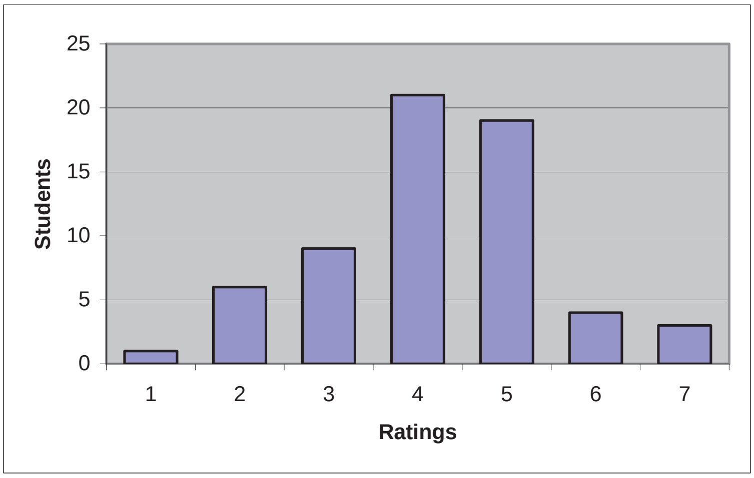
Results and discussion

Extensive feedback was provided by the three surveys. Students responded to questions about the topic materials and resources, their experiences of learning and working in online groups and their opinion of United Enterprises.

The surveys for Topic 1 and Topic 3 included two questions about United Enterprises:

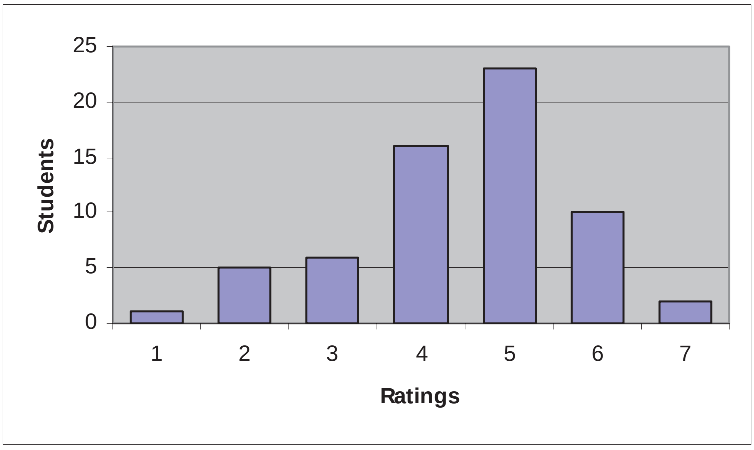
1 How do you rate United Enterprises as a learning resource? (Rating of 1 = 'Poor' to 7 = 'Excellent')
2 In your opinion how accurately does United Enterprises reflect a 'real-life' workplace? (Rating of 1 = 'Nothing Like It' to 7 = 'Very Similar').

For Topic 1 the responses to these two questions were positive, as shown in Figures 3 and 4. The majority of students rated UE as a 'good' learning resource that emulated the real world (Means of 4.2 and 4.8).



Note. Ratings from 1 = 'Poor' to 7 = 'Excellent'

Figure 3: UE as learning resource (Topic 1)

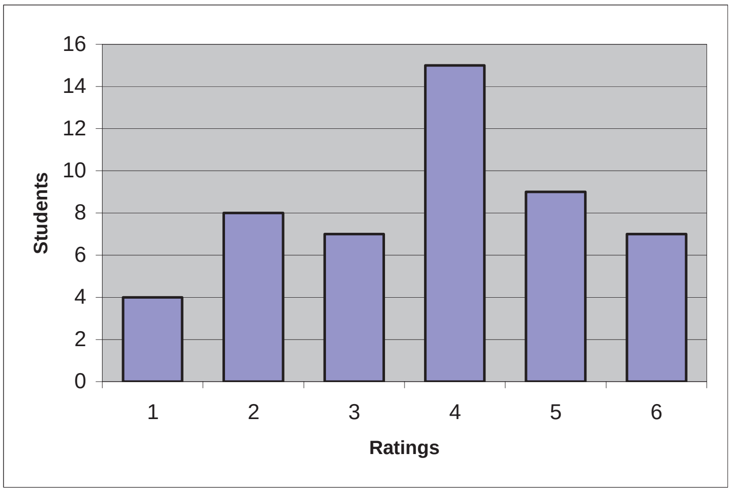


Note. Ratings from 1 = 'Nothing like it' to 7 = 'Very similar'

Figure 4: UE as 'real-life' (Topic 1)

When asked what were the best things about UE students responded with statements such as 'good team of people at UE'; 'good insight into a PM company' and 'lots of information which we eventually needed while working on the assignment'. Typical responses to what were the worst things were 'not enough information supplied about company' and 'lack of description about their employees' backgrounds'. Improvements suggested were 'to provide more detail about the organisation' and 'provide more interaction'.

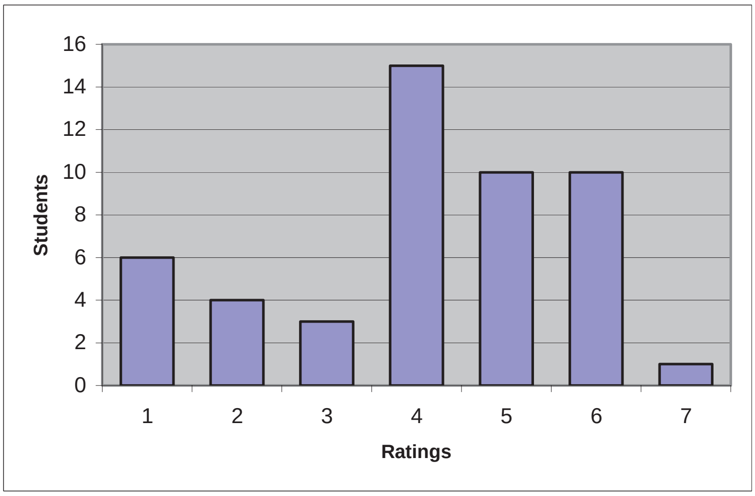
For Topic 3, the responses to the same two questions were still positive as shown in Figures 5 and 6 (Means of 3.8 and 4.1) but not as positive as the responses for Topic 1.



Note. Ratings from 1 = 'Poor' to 7 = 'Excellent'

Figure 5: UE as a learning resource (Topic 3)

One might expect that the level of satisfaction with a new approach might increase as students become more familiar with the environment and what they are expected to do (Dennan, 2000). This was not the case here. The addition of extra features in Topic 3 – the group collaborative workspaces and the interaction with UE employees – caused problems for students and detracted from their satisfaction with UE.



Note. Ratings from 1 = 'Nothing like it' to 7 = 'Very similar'

Figure 6: UE as 'real-life' (Topic 3)

Typical responses to what were the worst things were 'navigation was a problem', 'the ability for other students to subscribe to our group' (in reference to other students who subscribed themselves to other groups and were eavesdropping) and 'hard to keep track of posts in discussions'. The improvements suggested were 'to get the attachment manager working properly', 'have a discussion forum similar to DSO' and 'questions should be posted together, not under people's profiles'. On the whole the discussion forums and the method of uploading resources for others to view were considered difficult to use. The online environment is a socially unfamiliar place and any unfamiliar tool will only enhance the level of dissatisfaction with the environment (Miao et al., 2000).

External factors may have also contributed here. Topic 3 was released to students in Week 9, immediately after completion of Topic 2 where only DSO was used. The tutors reported that students had difficulty adjusting back to the UE environment. Students had not used the UE environment for some four weeks and were given little time to explore the additional features that UE now had. The assignment for Topic 3 also competed with several other large assignments due in other units in the same week. It should also be noted that the surveys were independent of each other and there is the likelihood that different students responded to each of the surveys.

The two tutors involved with their roles as Pat and Bill really enjoyed their new way of interacting with students. There was no script provided as to how they should conduct themselves but they managed to 'pull off' the roles as UE employees. Indeed no student to our knowledge realised that Pat and Bill were really part of the teaching team. From a practical view having UE employees to answer questions means that different tutors can act out the same role. Indeed, real experts can take on the role from time to time. Pat and Bill were also able to communicate with each other. At one stage Pat asked Bill about calculations for hourly rates in determining costs for the project as it was obvious that students were unsure about how to proceed. This type of scaffolding support is an essential component of problem-based learning.

Discussion with all the teaching staff revealed that many students were frustrated when team members did not contribute or when they left work to the last minute. The response to a question about how much work they did compared with other group members indicated that most students thought they did far more work than the rest of their group (Mean = 4.2). Topic 3 allowed students to allocate different marks to individuals but not many groups availed themselves of the opportunity. Despite the advantages of group work for peer learning, group work tends to be an issue in both face-to-face classes and online.

The teaching team also spoke about the emphasis on 'the task' and the fact that the processes in achieving the tasks were not particularly emphasised or rewarded. Processes such as how well they worked in a team, how information was shared and how critically they analysed each other's work are examples here. A key element in PBL is the reflection that takes place. No real reflection (lessons learned) was taken into account with the assessment for either topic.

Adoption of practices in the final unit

IT Practice was implemented in 2006 as a wholly online unit using the PBL approach described above and United Enterprises as the case study. The feedback from both students and staff through interaction with the prototype in 2005 has been used to guide and develop the new unit. Careful consideration was given to the types of tasks, how they would be delivered in the learning environment and how they would be assessed in a group learning context. In PBL the emphasis is on learners being actively engaged with the learning materials to acquire 'meaningful' learning.

The new unit has five modules, each with a core PBL task to drive the learning and allow for assessment. The assessment for each module is 20% of the unit and there are no formal examinations. Each module has a number of activities that must be completed both individually and as a group, and the final deliverable is usually a team report that requires extensive group discussion and interaction. Assessment takes into account the team submission (product) as well as the contribution of individual members to the team submission. For most modules the assessment includes an element of peer and self assessment.

DSO is the initial entry point for each of the modules. Learning materials (introduction, readings, resources); group activities; and discussion forums facilitated by a tutor, are available here. Students are given a week to complete the DSO tasks. In DSO students are *learners*. The focus of the module, however, is the PBL task which takes place in UE. All information about the task is provided within the UE website and all communication and collaboration takes place within the UE intranet. Employees of UE can be contacted to answer questions. The final submission, usually a team report, is emailed to the UE employee who initiated the task. The task in UE takes about two weeks to complete. While completing the task students are essentially *IT professionals* working on team projects which focus on different aspects of IT practice.

Most of the United Enterprises website has been redesigned and redeveloped by the Knowledge Media Division at Deakin University. Some of the student concerns about the navigation and resourcing in the prototype have been addressed. Due to time constraints it was not possible to create the collaborative workspaces (team forums) within the UE website maintained by the University. These UE team forums have been created using Drupal, the same open-source software used in creating the prototype. The UE team forums are currently hosted on a School server. Although this arrangement is not ideal, it has provided the teaching staff with more control over access and more flexibility in getting resources up quickly. To the students UE appears as a single website. Students need their login to access UE and a modified password to log in to their UE team forum. The UE team forums have been set up by the teaching team and students no longer subscribe to groups themselves. This reduces the possibility of students eavesdropping (spying) on other team forums.

Conclusions

The prototyping of an online unit to test out a pedagogical approach and a suitable learning context has been a success. It has allowed those responsible for setting up and delivering the final unit to try out an innovative approach and to study how users (students) are likely to react. The use of the prototype has allowed the design of the proposed system to be better defined and has allowed the development to proceed with a better set of requirements.

The teaching team of the new wholly online unit *IT Practice* was more confident that the proposed problem-based learning approach with the United Enterprises website would succeed. The feedback from the first offering of the new unit in 2006 suggests that we are on the right track.

References

Dennen, V. (2000). Task Structuring for On-line Problem Based Learning: A Case Study. *Educational Technology & Society, 3(3*), 329–335.

Duke, R., Salzman, E., Burmeister, J., Poon, J. & Murray, L. (2000). Teaching Programming to Beginners – choosing the language is just the first step. In *Proceedings of 4th Australasian Computing Education Conference*, (pp. 79–86). Melbourne, Australia, December.

Ellis, A., Carswell, L., Bernat, A., Deveaux, D., Frison, P., Meisalo, V., Meyer, J., Nulden, U., Rugelj, J. & Tarhio, H. (1998). Resources, Tools and Techniques for Problem Based Learning in Computing. In *Integrating Technology into Computer Science Education (ITiCSE): Working Group Reports and Supplemental Proceedings*, (pp. 41–56). Dublin, Ireland.

Farmer, J. (2004). Communication dynamics: Discussion boards, weblogs and the development of communities of inquiry in online learning environments. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds), *Beyond the comfort zone: Proceedings of the 21st ascilite conference*, (pp. 274–283). Perth, Australia, December.

Goold, A. (2004). Problem-based Learning in an Online IT Professional Practice Course. In *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2004*, (pp. 65–71).

Goold, A., Augar, N. & Farmer, J. (2006). Learning in Virtual Teams: Exploring the Student Experience. In *Proceedings of the 2006 Informing Science and IT Education Conference*. Manchester, UK, June. Available at: http://2006.insite.nu.

Greening, T., Kay, J. & Kingston, J. (1997). Results of a PBL Trial in First-Year Computer Science. In *Proceedings of 2nd Australian Computer Science Education Conference*, (pp. 201–206). Melbourne, Australia, December.

Lee, M. & Dong-See, K. (2005). The Effects of the Collaborative Representation Supporting Tool on Problem-Solving Processes and Outcomes in Web-Based Collaborative Problem-Based Learning (PBL) Environments. *Journal of Interactive Learning Research*, 16(3), 273–293.

Miao, Y., Holst, S., Haake, J. & Steinmetz, R. (2000). PBL-protocols: Guiding and Controlling Problem Based Learning processes in Virtual Learning Environments. In B. Fishman & S. O'Connor-Divelbiss (Eds.), *Fourth International Conference of the Learning Sciences*, (pp. 232–237). Mahwah, NJ: Erlbaum.

Vat, K. (2004). Towards a Learning Organization Model for PBL: A Virtual Organizing Scenario of Knowledge Synthesis. In *Proceedings of the 7th Annual Conference of the Southern Association for Information Systems*, (pp. 138–146). Savannah, USA, February.

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Who's learning? Responding to the needs of a culturally diverse world of online learners

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A literature review shows that online learning may be impeded for some learners of different cultural backgrounds. Therefore, guidelines are needed to help design courses that are culturally conducive for learners. This paper proposes that Vygotsky's sociohistorical theories provide a basis for designing these guidelines because they suggest that the sociohistorical background of a community can explain the learning processes of the community. A design research approach was used in this study to evaluate and modify the guidelines designed for an online course for learners from an Arabic community, exemplifying the use of this approach. Preliminary findings support the use of these theories for the design of guidelines for pedagogically sound, culturally favourable online learning environments.

Keywords: culture, online learning, sociocultural, design guidelines

Introduction

Today's world is becoming increasingly multi-cultural, and online courses are being designed for a growing number of cultures across the planet. But are people from these diverse cultural backgrounds learning successfully online? Research has shown that learners from different cultural backgrounds responded differently in their online courses. For example, in research on online learning courses, learners differ in the amount of interaction they feel comfortable with (Tu, 2001); support they require from each other and the tutor (Gunawardena et al. 2001); what they feel is important in building an online presence (Ku & Lohr, 2003; Morse, 2003); length of messages they write or read (Goodfellow et al. 2001); and the way they deal with conflict and group work (Gunawardena et al., 2001; Kim & Bonk, 2002). It has also been shown that some learners in a second-language environment interacted less online due to the amount of stress they felt in using a second language (Tu, 2001; Yildiz & Bichelmeyer, 2003), and some found it difficult to complete collaborative tasks successfully (Sarker, 2005), probably due to task types that require a richer environment of trust and community (McGrath & Hollingshead, 1993). Therefore cultural issues can have a significant impact on many aspects of learning online. As social presence, interaction, student centredness, collaborative learning and the development of cognitive skills are all inter-related aspects of the learning environment, then if one aspect of the learning environment compromises student learning, all areas will be affected and learning will be impeded. Therefore cultural values must be considered in course design. This means we need to understand the cultural issues that affect learning and use this to guide the design and implementation of our courses. In this study, the context of Oman will be used as an exemplar in suggesting how principles and guidelines may be proposed and tested to design online learning environments that are conducive to learners' cultural values and are pedagogically sound, giving the opportunity for everyone to learn.

Aim of the study

The aim of this study is to propose a means of developing theory-based and empirically refined guidelines for the design of online learning environments. These guidelines should be pedagogically sound and conducive to learners' cultural values. The development of this approach is exemplified in an Arab culture within an Omani context.

Literature review

Guidelines for considering cultural differences in the designing of courses

Some recommendations have been made for designing courses for cultural differences, such as those by Collis, Moonen and Vingerhoots (1997) and Henderson (1996). Their recommendations were based on a model Reeves (1992) proposed for analysing interactive learning systems; these were not intended to be 'mutually comprehensive or mutually exclusive' (p 100); that is, his model was incomplete, untested and unrelated to cultural issues. Others have recommended that increased flexibility in different areas in course design would make courses more culturally compatible. Collis (1999) suggested that courses should be designed with flexibility in each of Reeves' 14 dimensions to provide for differences within the cultural backgrounds of the learners. Others, such as Geer (2001) and Joo (1999), listed suggestions of issues that should be considered for courses that are culturally inclusive; for example in considering different decision-making styles, the usage of grammar in conveying meaning differently or the need for flexibility in learning goals. None of these recommendations have been shown to be based on empirical research, and neither do they justify why the particular recommendations have been selected; that is, it is not known to the reader if the proposals were intended to be a complete description as the researchers understood it, or if these were a random selection of recommendations. However, these untested models and recommendations, the lack of a theoretical basis for proposing a cultural model for learning, and the complexity in designing for cultural preferences all indicate the need to approach the preparation of a model or proposal from a more structured and justifiable basis.

Using a sociocultural approach for designing cultural models

Lev Vygotsky developed theories about learning that may be applied to understanding cultural preferences in learning. His theories essentially propose that learning requires other people in the process, that 'social relations underlie ... all higher functions' in learning' (Vygotsky, 1981 p. 163). This would mean that learning is a social activity and the thinking tools developed would be cultural tools, as learning is mediated by people in that environment. These theories also propose that the history of the society affects its culture, and therefore would also affect the tools learners develop and use in the learning process. This means that there may be a link between history, culture, and cognition; and thus a way to understand the learning processes of a society may be through understanding its social history.

Vygotsky proposed that learning is mediated. Caregivers or teachers use mediating tools such as signs, symbols and texts, and learners need to be taught how to use these tools. These tools are found twice: first externally with the caregiver, and, second, within the learner as psychological tools that have been appropriated. The type and structure of the tools reflect the values of the society, as they are selected and shaped by members of a society, especially parents and other relatives. Thus, according to Vygotsky's theories, the role of the mediator is very significant in the learning process and in the type of cognitive strategies that are developed. Some studies have shown a link between the values of the society and the way caregivers taught their children. For example, a field study on Mazahua people in Mexico found that knowledge was considered to be that which is 'acted out'(De Haan, 2002 p. 36); learning in this culture was through work, where parents would create opportunities for their children and where the parents could observe and direct or guide them. Their concepts of knowledge determined the way they taught their children. Other studies have shown that people from different cultures have different ways of thinking and use different cognitive strategies in the learning process. For example, Norenzayan, Smith, Kim and Nisbett (2002) found that when people from East Asia and the United States observed the same situation they evaluated it differently: where the Asians noticed the background or context, the Americans described the central object. In another study, Norenzayan et al. (2002) found that when Koreans made predictions about a situation, they included situational factors, whereas the Americans favoured personality factors. These studies suggest that learners from different cultural backgrounds focus on different issues in the same situation, and process knowledge differently. The cognitive development of these learners would therefore be dependent on the values and concepts of the caregivers and their cultural values, and this affects the types of tools that are selected and developed in the learning process. Thus the social environment and the learning are part of the one system: cognitive development is a 'process of acquiring culture' (Cole, 1985 p. 148). Therefore the social environment and learning may be a way of preserving the values and traditions of the society. It may also imply that changes in the cultural values of the society may change the way a person learns: that is that culture and learning have a historical perspective.

Vygotsky's theories are often described as sociohistorical theories because of the historical nature of culture and because an individual's cognitive development is essentially a historical process (Luria, 1974; Nell, 1999). Cultural practices and values appear slowly in society, building and adapting the previous practices; 'everything cultural is historical' commented Scribner (1985 p. 123). Thus according to these theories, the historical background of a culture may provide an understanding of the values and psychological tools used in learning. Luria (1974) proposed that if history affects the cognitive processes, then changes in social organisation may cause changes in these processes. The Russian Cultural Revolution provided an ideal opportunity for him to test this hypothesis. He found that people whose villages had undergone social changes caused by the revolution showed changes in their cognitive processes, in comparison to those in villages untouched by the revolution.

The above studies were not well known and were not felt to be of great significance (Cole, 1985; Nell, 1999) until recently. However, more recent studies may help support these findings. The cultural psychology theories of Richard Nisbett (2003) proposed that the constraints and context of the social environment shape the world view and belief systems of a community, and therefore affect the development of people's cognitive processes. In their research, Nisbett et al. (2001) compared two ancient cultures, Greek and Chinese, to determine how social practices affect cognitive processing. They postulated that the social organisation of cultures affects belief systems, epistemologies, and cognitive processes, as can be seen in the examples in Table 1.

Table 1: Examples of the effects of social practice on cognition

	Social organisation	Belief systems and cognitive processes
Greeks	• Strong sense of individual identity • Absence of social constraint • Personal freedom, • A tradition of debate	• The world is made of discreet objects to be categorised • Analytical, and logical • Debating valued
Chinese	• Identity was within roles and relationships with obligations to others • Confrontations discouraged • Group expectations and relationships between individuals are prescribed by the society	• The context described by relationships, not by rules or categorisation • Harmony valued, • Relationships valued. • Believed cosmic and earthly events were in harmony

Nisbett (2003) and Lloyd (1996) both found that the differences in social organisation of cultures, such as the Chinese and Greek, can be explained through an understanding of their historical backgrounds. The ancient Greeks lived by the sea, were engaged in individualistic activities such as fishing and came into contact with many other cultures. The ancient Chinese, by contrast, lived in a more homogeneous situation in their villages where they worked together on farms, and where group harmony would have been important to enable the community to function. Geography is a key factor in how a society lived; for example if peaceful relationships between people are necessary for the community to function, as in the rural Chinese society, then it is likely that relationships would be more highly valued than other concerns. The geographical setting of the Greek civilisation allowed a more individualistic lifestyle and personal identity was valued. Lloyd's (1996) studies of these ancient cultures included the writings of their early mathematicians and showed their different ways of cognitive processing. The Greek mathematicians in the third century AD used a deductive approach, and the Chinese by 'an explanation of how and why it works' (Lloyd, 1996 p 18). Thus it can be seen that for these two cultures, the economic and geographical history of the society affected the way they lived and what they valued and focused on. This in turn affected their epistemologies, their worldview and their cognitive process; these views and values would then be either affirmed or modified by the society and passed on to the children.

All these studies suggest that changes in the social organisation of a society may be reflected in changes in the cognitive processes of the learners. That is, history shows that the constraints on the social organisation of a society affect the epistemologies and worldview of the community members which then shape their values and practices. These values and practices are passed on to others through mediated learning. Changes to the constraints on the society may change the worldview or cultural practices, which in turn change how learning is mediated and the cognitive processes that develop. Although more research would be required to establish these conclusions, the findings are consistent with Vygotsky's theories of the relationship between culture, its historical foundations, and the learner. This suggests that a socio-cultural approach may be a way to understand how to design learning environments of learners in either single culture or multi-cultural classrooms. As Gutierrez and Rogoff (2003) noted, a sociocultural approach defines culture, not as individual traits, rather as values and practices of a community. Therefore, determining the 'history and valued practices' (Gutierrez & Rogoff, 2003 p 20) of learners will help describe what cultural practices and values that group of learners may have. Gutierrez and Rogoff

(2003) suggested that studies on the different communities represented in the classroom should aim to find commonalities between the groups for the design of teaching and learning processes; and this will help teachers to respond to the diverse cultural needs of the learners. Thus, the initial step for course design for multicultural or single cultural classes is in researching the social history of a particular group of learners, as is exemplified in this research for learners from an Arab community.

Sociohistorical view of an Arab community

The Arabian Peninsula is characterised by a large expanse of desert and an overwhelming lack of water, thus defining the lifestyle of the inhabitants. A large number of early Arabs were Bedouins who had a nomadic existence in the search for water and other resources. The harshness of this existence forced them to live in small tightly knit tribes, and Arabs who settled often lived around oases with a similar lifestyle to the nomadic Bedouin. Clans were the basis of their society, and were made up of several families with a number of kindred clans making a tribe, and Hitti (1996) commented that this 'demands boundless and unconditional loyalty to fellow clansmen' (paragraph 6). Thus the early Arabic civilisation was collectivist (community oriented) in its nomadic existence and in the closeness of the tribe, with harmonious relationships and shared understandings being characteristic of their lifestyle. The Arab culture is still collectivist today, especially in the Gulf, with an emphasis on family and tribal loyalties (personal observation).

Vygotsky's theories described language as the most powerful tool in mediating culture and a 'profound part of the higher psychological processes' (Vygotsky, 1978 p 126), therefore this can be another tool that shapes thinking. In his seminal studies on oral cultures and language, Walter Ong (1982) proposed a similar viewpoint, that the way a language is used affects the way people think, as this would determine how knowledge, skills and traditions are transmitted within the society. The Arabic language historically has been valued for its poetic characteristics, and as a 'device for social means as much as it is for carrying information' (Zaharna, 1995 p 246). Thus the way the Arabic community values its language promotes and affirms the historical participatory values of their community. The Arabic language also is primarily intended to be heard or recited, not just read. This oral characteristic affects the values of the community (Ong, 1982). Knowledge held in a spoken (oral) form is 'designed to be remembered after simply having been heard' (Jousse, 1990 p 231), and the rhythm and rhyme to help in recalling information in a sustained manner, and these are proposed to promote more a visual and participatory approach in the learning process. Therefore, if language does shape the psychological processes as Vygotsky proposed and Ong supported, then these characteristics of language should be used to propose cultural values in learning for people from this cultural background.

The collectivist close-knit tribal structure of the Arabic social background and the role and oral nature of their language are therefore proposed to determine and support the cultural values of their society. Accordingly, these values and preferences should be examined to provide tentative proposals for preferred ways of learning for this community.

Developing guidelines for culturally compatible courses

Proposed Arabic cultural values in learning

Following the study of the Arabic community's sociohistorical background, several points are proposed concerning its values and how these may affect the learning process:

- The community orientation of society meant relationships have a high priority. Nisbett (2003) found that societies with this type of social organisation are more likely to see items less as discrete objects, and more likely in context with its environment. This may result in a less deductive approach to understanding and explaining individual items, and a greater awareness of the context of the item to carry the meaning.
- Learners from an oral background tend to be more visual. Zaharna (1995) explains that this is because they are more people or event-orientated, where objects are seen, not as discrete linear objects, but within the context of their environment. Thus, the visual presentation in the learning environment is needed to help learners visualise the concepts, either through multimedia aids, or through creative use of language that can enable learners to develop their own mental images.

- The story has been a very powerful force within an oral culture. Stories provided the social-collective identity of the culture. Learning based in stories could be more meaningful, and should allow for learner participation with other people, for example, with role-plays where appropriate.
- Ong (1982) explained that as knowledge in an oral culture is more human-related, learning therefore was more situational and centred around activities and with other people. Therefore learning should be situated within real world experiences; learning alongside an expert, as in apprenticeship, would be a culturally suitable way to learn (Ong, 1982).
- In an oral culture, the adults or narrators held knowledge; there was no other source. Therefore they were held in great respect. Much of this knowledge was with the narrator, whose stories carried the values of the community, defined the culture's identity and could be a force of disruption or of stability (Folaron, 2002). Therefore in learning, the tutor has a central role.

Thus a sociocultural approach to understanding a community of learners can suggest several different cultural values that may determine learning processes and preferences. These can be used to propose design guidelines for online learning environments

Table 2: Summary of possible learning preferences for an Arabic learning community

Cultural values	Proposed learning preferences
Community	Descriptive analyses may be preferred more than deductive analyses. Items are understood in their context, not in isolation.
Visual imagery	Language should develop rich mental images and concepts. Visual-based content may be preferred to text-based Other visual tools may be preferred
Story-based	Situated learning that is story-based or provides a genuine or vicarious experience may be preferred Use of metaphors may be valued in descriptions
Human-related	Apprenticeships providing scaffolding and other human-based support may be preferred. The relationship with the tutor may be very important.

Using the cultural values for designing learning environments

The learning preferences that have been proposed for a group of learners could be used to propose design guidelines for the learning environment, which can then be tested for their validity. In this study, the aim was to design guidelines for the online environment for the local context. Therefore the following steps were taken:

- research of the literature to analyse the response of learners to their online learning courses
- categorisation of the findings into five concepts of social presence, interaction, collaborative learning, cognitive strategies, and student-centred learning; these inter-related concepts are considered to describe effective pedagogically sound online learning environments
- proposal of guidelines for course design, based on the findings in these categories
- addition of further guidelines based on the proposed cultural learning values of learners from an Arabic community.
- the guidelines were re-categorised to enable their use in course design, namely: design of course, orientation for learners, and implementation of the course.
- an online course was then designed and implemented with a group of participants.
- empirical research is being done to modify and refine the proposed guidelines.

A total of 50 guidelines were proposed based on the review of the literature. Examples of some social presence guidelines can be seen in Table 3.

Table 3: Guideline examples based on literature review

1	Use discussion forums, chat and email; they all contribute to social presence in different ways so they should all be used in online courses (Tu, 2002)
2	Use the social networks that are already in the classroom as they have a significant impact in developing social presence (Wegerif, 1998; Yang & Tang, 2003).
3	Encourage learners to interact frequently. Participants need to cross a 'threshold' in the amount of online interaction. Those who do not interact sufficiently do not 'cross the threshold' and find the environment unfriendly (Wegerif, 1998).
4	Expect that learners may perceive social presence levels differently. As social presence is a perception, people may respond differently to the same environment (Ku & Lohr, 2003; LeBaron *et al.*, 2000; Morse, 2003; Tu, 2001). Learners in this culture may prefer higher levels of interaction than would be expected in other learning contexts (Zaharna, 1995).

Evaluating and refining design guidelines

Context of the study

The guidelines were tested in a two-month fully online professional development course for instructors at a university. Approximately one third of the faculty members were Omani, one third non-Omani Arabs, and the other third were from the rest of the world (Sultan Qaboos University, 2004). The Arabic culture was selected for this study, as this was one community that represented a majority of the instructors, and because of the researcher's interest in studying the learning preferences of this society.

Method

A design research method was chosen because the goals of this research are outcomes that benefit teaching practice, and because design research has been developed as a 'means to test and refine educational design' (Collins, Joseph & Bielaczyc, 2004) in the attempt to solve teaching and learning problems. Design research is comprised of four stages:

- recognition of a problem
- a proposal for a solution
- testing and refining of the solution in context of use, and finally
- production of the tested and adapted solution.

In design research, formative evaluations are used, as the proposed solution is tested and modified repeatedly. Data from the evaluations are employed to modify the theory, which then is used to adapt the course. Thus, there are two products: first a theory driven model and secondly a set of guidelines, modified through use (Cobb et al. 2003; Reeves, 2000). Design research calls for data to be gathered from a variety of sources and an in-depth understanding of the learners' responses to the learning environment. Thus a case study approach was assumed to be the most effective method for this research. Mertens (1998) described case studies as being an intense study on a group in a bound system, where data is collected through several means, for example in interviews, participant observations and documents. Three research participants were selected from the twenty faculty members who were on the course. As each case study is similar to an experiment, not to a sample, participants were chosen according to the case study principle of repeatability of results where each case should be able to support the findings of the other cases (Yin, 1999). Participation was through informed consent. These participants were treated as separate cases, with the results being treated separately and then later used as a basis for generalization of findings.

Data collection and analysis

Timetables and templates were used as a basis to organise data collection. There were three cycles of research within the two-month course. In each cycle, data was collected from participant interviews, participant observation records and analysis of discussion transcripts and assignments. The research participants' discussion transcripts were analysed for content using a design developed by Poole (2000), and for discourse using principles proposed by Henri (1991). As the guidelines proposed were organised into the five different online concepts, the data was categorised in the same way. This occurred in each cycle; each case study, between each case and also between the different cycles. This generated a large amount of data, but the five theoretical concepts helped focus the collection and analysis. The data for each participant in each of the five online concept areas was then analysed for commonalities, and these were compared against the guidelines that had been proposed in each of the five concept areas. Thus, the findings were used to change the theory, that is, the proposed guidelines. The data analysis resulted in a number of proposed changes to the guidelines as can be seen in Table 4; this shows the modifications made to the guidelines exemplified in Table 3. Following the principles of design research, a peer reviewed these proposals to determine if the evidence was sufficient to enable the modifications to be made. Once the modifications were approved, they were then used to modify the online course so that the changes could be then be further evaluated in the next cycle of research. Modifications or additions were proposed in each of the cycles of research, but further testing is necessary in another course before these can be proposed as confirmed findings.

Table 4: Guideline examples following research on one online course

1	Use of discussion forums and chat may not be the main tools to develop (R3) social presence, but they may support it. Other means should be used such as email and instant messaging (R3). More use should made of the chat room from the first week, and individual encouraging emails should be sent by the facilitator regularly until the participants are into the course community. (R1).
2	Use the social networks that are participants already have, or provide groups of people within a close circle, as they may be the most significant factor in developing social presence. (R3)
3	NEW: Expect that some learners will feel more comfortable and motivated when they are accountable and committed to others, therefore design activities that require learners to be responsible to each other in completing the work (R2, R3).
4	NEW: Provide initial face-to-face classes to enable participants to get to know each other visually and to be able to build relationships so they will want to communicate and work together (R1)

Note. R1, R2, R3 indicate which research cycle identified these issues.

Summary of initial findings and resultant changes to the course

It was found that the research participants perceived a lack of social presence, required more structure, more support, more synchronous and face-to-face meetings, and the opportunity to get to know others before the course started. Some expressed a need for accountability, appreciation of high amounts of tutor interaction, and the preference to work in groups where there are commonalities between group members. Discussion forums were not found to build affinity due to insufficient interaction, language barriers, and the more formal nature of interaction, as forum participants felt restricted in sharing freely with those they were not close to.

It was also found that the e-learning orientation unit was perceived to have excessive text, and was not valued for its learning benefits. Some of the cognitive tools introduced in this unit were not used properly in the course. These cognitive tools provided support for the chat, forum, group work and assignments.

These responses were used to propose changes in the design guidelines, initially as tentative changes; further cycles of research are necessary to affirm changes. The modified guidelines then directed changes to the course. This included a change from online to face-to-face orientation, formation of groups based on commonalities from the start of the course, more face-to-face time to provide scaffolding, greater use of instant messenger, email, participant-led chats and tutor interaction, as well as the use of cooperative tasks to increase accountability and commitment. The modified guidelines also directed changes in the placement of tool introduction into the context of use, such as chat and forum guidelines being linked to the discussion and chat rooms. Orientation was also redesigned to be an active and interactive example of an e-learning course.

Some of the course and guideline modifications could be tested, as can be seen in Table 4. Other course changes and guidelines, such as those relating to the initial stages of the online course, will be tested in the next cycle of research.

Discussion of findings

There were 12 guideline changes proposed. Eight of these concerned the social aspects of learning. This may have been partly because two of the cases researched did not complete the course and therefore there was insufficient data to propose other changes. However, this large number of modifications required in the social aspect of learning does indicate that the social environment was sufficiently incompatible with the research participants' own cultural values that it prevented them from completing the course. As Dunn and Marinetti (2005) found, many people drop out of courses because of cultural incompatibility.

The eight modified social presence guidelines covered five out of the six guidelines that had been expected to be general principles of online learning, that is, 'non-cultural'. This suggests that learning may be more culturally dependent than is assumed in online learning research; this is consistent with the sociocultural concept that culture and learning are intertwined (Cole, 1985). This also affirms the importance of researching the cultural background of learners to determine what their learning preferences may be.

The results of this study found that the research participants preferred to be part of a committed group from the beginning of the course. This view is supported by the literature which describes the Arab culture as being collectivist (Zaharna, 1995) and based on loyalty and devotion to the family and tribe (Hitti, 1996). Although this concept was in the literature review, it was not realised that this was a learning concept that would be important in course design. Although a literature review can identify social organisation patterns or worldviews, they may not show which of these aspects are important in designing effective learning environments, or researchers may not be aware of how they relate to learning; empirical research is necessary.

The research so far has found three values in the local context that may be important in the design of the online environment for this community: the significance of being part of a responsible committed group, the importance of visual or face-to-face components in the environment and the use of human-related guidance such as scaffolding and modelling. These three values were seen in the literature research on the historical basis of the social organisation patterns on the Arabic community, affirming the value of a histocultural approach to understanding the cultural values of learners' community, and therefore a means to design online courses where everyone may learn.

Limitations

The findings of this research so far are preliminary and incomplete. Even though a large amount of useful data was collected and analysed, two of the three research participants did not complete the course, and so the collection was incomplete. Also, as the course was only eight weeks, it was difficult to carry out sufficient evaluation on some of the modifications to the proposed guidelines. Therefore, another online course will be tested at a later date. Further studies would also need to be done on other learning communities to determine how generalisible this approach can be.

Summary

Who's learning? A review of literature found that learners from different cultural backgrounds might not be learning effectively due to their different cultural preferences. Learning needs to be designed to give everyone an equal opportunity to learn. However, as no empirically and theory based cultural models for designing learning environments have been identified; new theories need to be proposed. This study proposed that the sociohistorical theories of Vygotsky might be a suitable basis. They proposed that the social organisation of a community affects how a person learns, and therefore knowledge of a society's social patterns and history may identify the cultural preferences of a community of learners. For multicultural classes, commonalities can be found and used as a basis for course design. This concept was exemplified in a study on learners from an Arabic community.

Guidelines for designing online learning environments were proposed, based on a literature review of student responses to learning online, and on suggested learning preferences of an Arabic community. These guidelines were then tested and modified based on research on Arabic participants in an online course. The initial findings have supported this approach. Further testing on guidelines for this community is necessary and will be carried out later this year.

References

Cobb, P., Confrey, J., diSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher, 32*(1), 9–13.
Cole, M. (1985). The zone of proximal development; where culture and cognition create each other. In J. Wertsch (Ed.), *Culture, communication, and cognition: Vygotskyian perspectives* (pp. 146–161). Cambridge: Cambridge University Press.
Collins, A., Joseph, D., & Bielaczyc, K. (2004). Design research: Theoretical and methodological issues. *Journal of the Learning Sciences*, *13*(1), 15–42.
Collis, B. (1999). Designing for differences: Cultural issues in the design of www-based course-support sites. *British Journal of Educational Technology, 30*(3), 201–215.
Collis, B., Moonen, J., & Vingerhoets, J. (1997). Flexibility as a key construct in European training: Experiences from the Telescopia Project. *British Journal of Educational Technology*, *28*(3), 199–218.
De Haan, M. (2002). Distributed cognition and the shared knowledge model of the Mazahua: A cultural approach. *Journal of Interactive Learning Research*, *13*(1), 31–50.
Dunn, P., & Marinetti, A. (2005). Cultural adaptation: Necessity for global elearning learning, *New Economy e-Magazine*: LineZine.com.
Folaron, D. (2002). Oral narrating and performing traditions in the history of modern middle eastern and Maghrebian theatre and drama. *Arab Culture and Civilisation* Retrieved 11 Jul 2005, from http://arabworld.nitle.org/texts.php?module_id=5&reading_id=354&sequence=2
Geer, R. (2001). *The necessity of considering cultural influences in online collaborative learning.* Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications, Chesapeake, VA.
Goodfellow, R., Lea, M., Gonzalez, F., & Mason, R. (2001). Opportunity and e-quality: Intercultural and linguistic issues in global online learning. *Distance Education, 22*(1), 65–84.
Gunawardena, C., Nolla, A. C., Wilson, P. L., & Lopez-Islas, J. R. (2001). A cross-cultural study of group process and development in online conferences. *Distance Education, 22*(1), 85–122.
Gutierrez, K., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice. *Educational Researcher*, *32*(5), 19–26.
Henderson, L. (1996). Instructional design of interactive multimedia: A cultural critique. *Educational Technology Research and Development, 44*(4), 86–104.
Henri, F. (1991). Computer conferencing and content analysis. In A. R. Kaye (Ed.), *Collaborative learning through computer conferencing.* (pp. 117–136). Berlin: Springer.
Hitti, P. K. (1996). The original Arab, the Bedouin. Retrieved 19 Feb 2006, from http://www.oneworldmagazine.org/focus/deserts/hittstr1.htm
Joo, J.-E. (1999). Cultural issues of the internet in classrooms. *British Journal of Educational Technology, 30*(3), 245–250.
Jousse, M. (1990). *The oral style* (E. Siendaert & R. Whitaker, Trans.). New York: Garland Publishing, Inc.
Kim, K.-J., & Bonk, C. J. (2002). Cross-cultural comparisons of online collaboration. *Journal of Computer-Mediated Communication 8 (1)*, 3 Sep 2005, from http://www.asusc.org/jcmc/vol8/issue1/
Ku, H.-Y., & Lohr, L. L. (2003). A case study of Chinese students' attitudes toward their first online learning experience. *Educational Technology, Research and Development*, *51*(3), 95–102.
LeBaron, J., Pulkkinen, J., & Scollin, P. (2000). Problems of student communication in a cross-cultural, international internet course setting. *Ed Media, 2000, a conference of the Association for the Advancement of Computing in Education* Retrieved 4 December 2004, from http://gse.uml.edu/lebaron/edmedia2000.htm
Lloyd, G. (1996). Science in antiquity: The Greek and Chinese cases and their relevance to the problems of culture and cognition. In D. Olson & N. Torrance (Eds.), *Modes of thought: Explorations in culture and cognition* (pp. 15–33). Cambridge: Cambridge University Press.
Luria, A. R. (1974). Cognitive development its cultural and social foundations. Retrieved 28 Jun 2006, from http://www.marxists.org/archive/luria/works/1976/problem.htm
McGrath, J. E., & Hollingshead, A. B. (1993). Putting the "group" back in group support systems: Some theoretical issues about dynamic processes in groups with technological enhancements. In L. M. Jessup & J. S. Valacich (Eds.), *Group support systems: New perspectives* (pp. 78–96). New York: MacMillan.
Mertens, D. M. (1998). *Research methods in education and psychology: Integrating diversity with qualitative and quantitative approaches.* Thousand Oaks: Sage.

Morse, K. (2003). Does one size fit all? Exploring asynchronous learning in a multicultural environment. *Journal of Asynchronous Learning Networks*, *7*(1), 37–55.
Nell, V. (1999). Title: Part i: International extensions of Luria's neuropsychological investigation. *Neuropsychology Review, 9*(1), 45–52.
Nisbett, R. E. (2003). *The geography of thought: How Asians and Westerners think differently and why*. London: Nicholas Brealey Publishing.
Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review, 108*(2), 291–310.
Norenzayan, A., Edward E. Smith, Kim, B. J., & Nisbett, R. E. (2002). Cultural preferences for formal versus intuitive reasoning. *Cognitive Science*, *26*(5), 653–684.
Ong, W. J. (1982). *Orality and literacy: The technologizing of the world*. London: Routledge.
Poole, D. (2000). Student participation in a discussion-oriented online course: A case study. *Journal of Research on Computing in Education, 33*(2), 162–177.
Reeves. (2000). Socially responsible educational technology research. *Educational Technology., 40*(6), 19–28.
Reeves, T. (1992). *Effective dimensions of interactive learning systems.* Paper presented at the Second International Conference on Information Technology for Training and Education, University of Queensland.
Sarker, S. (2005). Knowledge transfer and collaboration in distributed U.S.-Thai teams., *Journal of Computer-Mediated Communication*.
Scribner, S. (1985). Vygotsky's uses of history. In J. Wertsch (Ed.), *Culture, communication, and cognition: Vygotskyian perspectives* (pp. 119–145). Cambridge: Cambridge University Press.
Sultan Qaboos University. (2004). *2003/2004 sultan qaboos statistical year book*. Muscat: Sultan Qaboos University.
Tu, C.-H. (2001). How Chinese perceive social presence: An examination of interaction in online learning environment. *Educational Media International, 38*(1), 45–61.
Tu, C.-H. (2002). The measurement of social presence in an online learning environment. *International Journal on E-Learning, 1*(2), 34–45.
Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.
Vygotsky, L. (1981). The genesis of higher mental functions. In J. V. Wertsch (Ed.), *The concept of activity in soviet psychology.* Armonke: Sharpe.
Wegerif, R. (1998). The social dimension of asynchronous learning networks. *Journal of Asynchronous Learning Networks, 2*(1), 34–49.
Yang, H.-L., & Tang, J.-H. (2003). Effects of social networks on student's performance: A web-based forum study in Taiwan. *Journal of Asynchronous Learning Networks*, *7*(3), 93–107.
Yildiz, S., & Bichelmeyer, B. A. (2003). Exploring electronic forum participation and interaction by efl speakers in two web-based graduate-level courses. *Distance Education, 24*(2), 175–193.
Yin, R. K. (1999). Enhancing the quality of case studies in health services research. *Health Services Research, 34*(5), 1209–1215.
Zaharna, R. S. (1995). Bridging cultural differences: American public relations practices & Arab communication patterns. *Public Relations Review*, *21*(3), 241–255.

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Professional development for online teaching practices

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This study found that early adopters perceive professional development activities, which promote the sharing of experiences and examples of practice, as the most useful ways of developing knowledge about online teaching practices. Early adopters see the development of practical skills, in particular technical and pedagogical, as key in developing online teaching practices.

The professional development activities that early adopters identified as the most useful in developing these practical skills were discussion between peers, face-to-face workshops, one-on-one consultation and mentoring. In contrast, the findings suggest that early adopters found it less useful to attend conferences, read journal articles or books, gain online qualifications or visit websites to learn about online teaching practices.

This paper recommends that more research be undertaken to determine how the less useful professional development activities identified in this study, in particular conferences and websites, could better meet lecturers' needs.

Keywords: early adopters, professional development, online teaching practice

Introduction

This paper reports on two aspects of a larger research project which investigated how early adopter lecturers adapted and developed their classroom-based teaching practice for the online environment. The purpose of the research was to inform the design of a professional development programme for flexible learning in a New Zealand university. The aspects addressed in this paper are the types of professional development early adopters had engaged in to learn about online teaching practices and the skills they had learned as a result of teaching online. These aspects are located within the literature review which reflects the larger research project.

The project used an exploratory approach, based on a mainly qualitative research design, within a case study method. The participants were selected from lecturers in the early adopter category, in a medium-sized, New Zealand university. A mail-in survey and semi-structured individual interviews were used to gather data concerning: the professional development activities early adopters have undertaken to learn about online teaching practices, further activities they would like to undertake, the new skills they had learned as a result of teaching online, and new skills they would like to learn.

While a limitation of the study is the small size of the sample, the findings have assisted the design of a professional development programme, as well as highlighting the need for further research on the types of professional development activities and skills lecturers require to develop online teaching practices.

Literature review

The adoption of technology

The Diffusion of Innovations model (Rogers, 1995), is a theory of the adoption of technology, often used in tertiary education to demonstrate how new technologies are implemented by lecturers over a period of time (Wilson & Stacey, 2004). Rogers' (1995) model is frequently cited in technology based studies, however research by Wilson & Stacey (2004) suggests that recently there has been a tendency in the literature to condense the model into just two categories of lecturers called *early adopters*, and the *mainstream majority*. A description of the characteristics of lecturers who belong within these two categories follows:

Early Adopters: The early adopters (Rogers' innovators and early adopters) are described as visionaries and experimenters; they see technology as fun and challenging; are technology focused; project-oriented; self-sufficient; willing to take risks for 'break through' achievements; and they tend to network horizontally, across interdisciplinary and cross-functional groups (Bailey, 2002; Wilson & Stacey, 2004). Lecturers who fall within the early adopters' category are the focus of this study.

Mainstream Majority: The mainstream majority (Roger's early majority, late majority and laggards) are described as pragmatic; conservative; risk averse; process oriented; tend to network vertically, within a single discipline area; expect proven applications for the use of technology in teaching; and require more support, as they are less likely to be technology-focused, confident computer users (Bailey, 2002; Wilson & Stacey, 2004).

Experiences of early adopters

Differences in the attitudes and abilities of lecturers described within the 'adopter categories' may impact on the content of professional development programmes (Wilson & Stacey, 2004). Recent studies describe a gap between the abilities of the early adopters and mainstream majority as widening, making the transition from classroom to online teaching critical, especially for the latter group (Bailey, 2002; Waldron, Dawson, & Burnett, 2005; Wilson & Stacey, 2004). Research by Wilson & Stacey (2004) suggests that early adopters tend to make the adoption of technology look fairly easy, disguising the knowledge and skills other lecturers need in order to do the same. They suggest that professional development strategies for early adopters are not necessarily suitable for the mainstream majority, and that this gap should be studied further.

Furthermore, Bailey (2002) proposes research to examine whether there are differences between pedagogical approaches used by early adopters and the mainstream majority. Milne & White (2005) reported on a study which suggested that lecturers felt they had enough information related to technology, but not enough information about effective online teaching practice. Major concerns of lecturers in a study by Torrisi-Steele & Davis (2000) were their perceived lack of knowledge about 'how it works' and 'what is possible' in an online environment, specifically asking for access to others' experiences in developing online teaching and learning resources. Lecturers can benefit from collegial support which encourages the sharing of experiences and ideas, as well as assistance with technology and pedagogical issues (Ellis & Phelps, 2000; Mitchell, Clayton, Gower, Barr, & Bright, 2005).

Laurillard (2002) suggests lecturers should acquire a knowledge of pedagogy as applied to technologies such as multimedia, software and hardware, as the design of learning resources cannot simply be inferred from the capabilities of technology. The development of technology resources is a significant component of online learning and their design should revolve around the students' use of them (Torrisi-Steele & Davis, 2000). A study of online professional development by Ellis & Phelps (2000) described how lecturers learned to produce video, audio and HTML files to create their own technology resources, thereby 'owning' the products they created. Ellis & Phelps (2000) suggest that much online development has occurred by early adopters keen to experiment with technology and who have the technical skills to develop online courses. However, while early adopters are deemed to have positive attitudes towards technology and teaching practice, many tertiary lecturers are subject specialists rather than trained teachers, and they may be lacking technological and educational knowledge, to design courses which develop deep approaches to student learning.

Ramsden (2003) suggests that teachers who apply practical teaching strategies without an understanding of how they fit within a teaching approach, are less likely to help their students learn; therefore teachers who integrate theory and practice are more likely to understand how their teaching practices will affect the quality of their students' learning.

Method

The research project was carried out using a mainly qualitative approach bound by a case study method, to investigate the experiences of early adopters adapting and developing their classroom-based teaching practices for the online environment. A combination of a mail-in survey, semi-structured, individual interviews and online course observation was used to gather data. The course observation is not reported on in this paper.

Selection of participants

It was necessary to identify early adopter lecturers for the survey, and early adopter lecturers who had redeveloped their online courses over a period of three or more semesters for the interview and course observation. The University began using a learning management system (LMS) in 2003. When this project was carried out in 2005, the proportion of university staff enrolled in the LMS was 22% of all staff. Rogers' (1995) model, suggests that 16% of lecturers in an institution may be identified as innovators and early adopters. Taking into account the limitations of identifying lecturers who used the LMS for teaching, these figures suggested that the University was just passing through the early adopter stage at the time this study took place. Therefore it was reasonable to suggest that most of the participants in the study would be from Wilson and Stacey's (2004) early adopter category.

Limitations

The surveys were sent to all staff (n = 225) enrolled in the LMS, and 14% (n = 31) were returned fully completed. The way in which user statistics are reported on the University's LMS database, made it difficult to distinguish between staff who used the LMS for teaching and those who used it for other purposes. For example, staff using the LMS for professional development courses or online meetings showed up in the statistics. As the survey was sent to all staff listed in the LMS address book, the number of lecturers who used it for teaching was not able to be identified and this skewed the reporting response rates. Data relating to the Faculties in which the interviewees belonged was collected. Although the sample size is small and limited demographic information was collected, the purpose of the research was to benefit the university in which it was carried out.

Data

The survey questions were designed to gather specific information which may not arise from the interviews. The survey consisted of eight questions, and responses associated with four of the questions are presented and discussed in this paper:

1 Tick any of the following professional development activities you have engaged in to develop your knowledge about online learning.
2 Circle the three professional development activities that were most useful to you. Other activities?
3 Comment on any new skills you have learned as a result of using the online LMS.
4 What new skills would you like to learn regarding online teaching practices?

For questions 1 and 2, respondents were asked to select from a list of professional development activities, with 'other' providing the opportunity to state any activities not on the list. The activities were selected from information provided in the University's yearly professional development booklet. Questions 3 and 4 were open questions and have been analysed according to the professional development workshop categories devised by Ellis & Phelps (2000): *administrative, pedagogical, and technical*. Analysis revealed that an additional category called *research* was necessary for this study.

Semi-structured, individual interviews were undertaken to gain an in-depth understanding of early adopters' experiences in adapting and developing teaching practices for the online environment. The interview questions were based on Ramsden's (2003) framework for *evaluating and recognising effective teaching*. The framework provides a series of questions which focus on pedagogy, teaching strategies, feedback, assessment, quality of learning, self-evaluation, communication and scholarship of teaching. This paper presents and discusses the 8 interview responses related to the final category of Ramsden's (2003) framework – *Communication and Scholarship*, as it relates to the professional development aspects which are the focus of this paper.

5 *C*ommunication and scholarship related to online learning:
   a. What have you done to learn from other lecturers and to share your insights with other lecturers?

b. What steps have you taken to apply the best available evidence to improve your practice?

Findings

Question 1: Tick any of the following professional development activities you have engaged in to develop your knowledge about online learning.

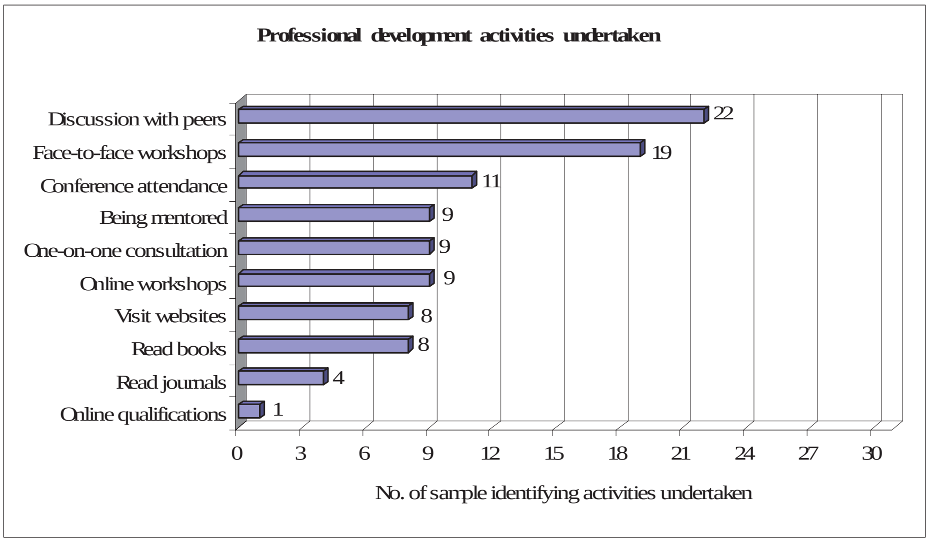

Figure 1: Professional development activities undertaken

The most common activities undertaken were discussion with peers, face-to-face workshops and conferences. In this study, one-on-one consultation refers to an academic developer visiting with a lecturer to help them with pedagogical and technological aspects of online learning. Reading journal articles and studying for qualifications in online learning were the activities least frequently carried out. The category of research grants was not included, however, how to write funding grants was identified as a new skill learned, and this would be a useful activity to include in future research.

Question 2: Circle the three professional development activities that were most useful to you. Other activities (Please list).

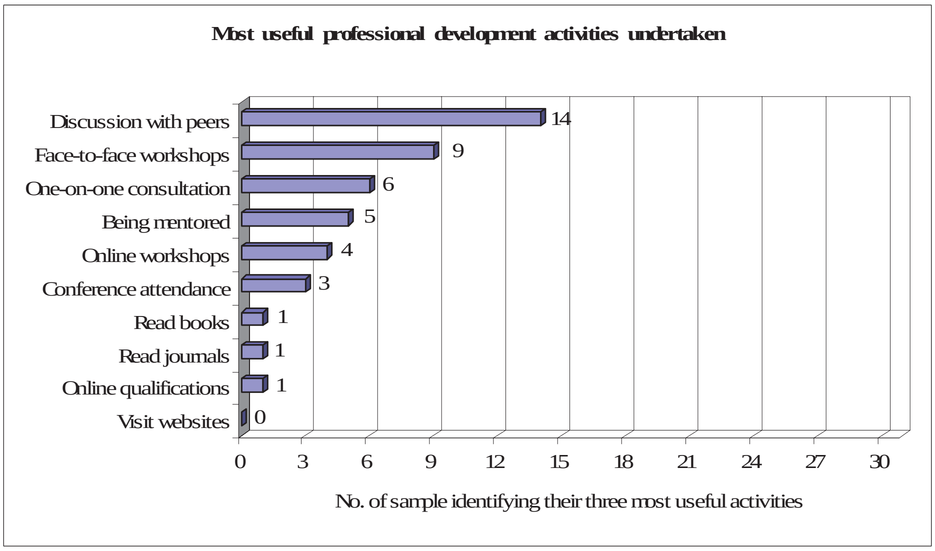

Figure 2: Most useful professional development activities undertaken

The most useful activities were discussion between peers, face-to-face workshops and one-on-one consultation, followed by mentors, online workshops, conferences, journals, books and study for online qualifications. Although websites were the seventh ranked activity undertaken, it was not selected by any of the respondents as a useful activity.

Question 3: Comment on any new skills you have learned as a result of using the online LMS.

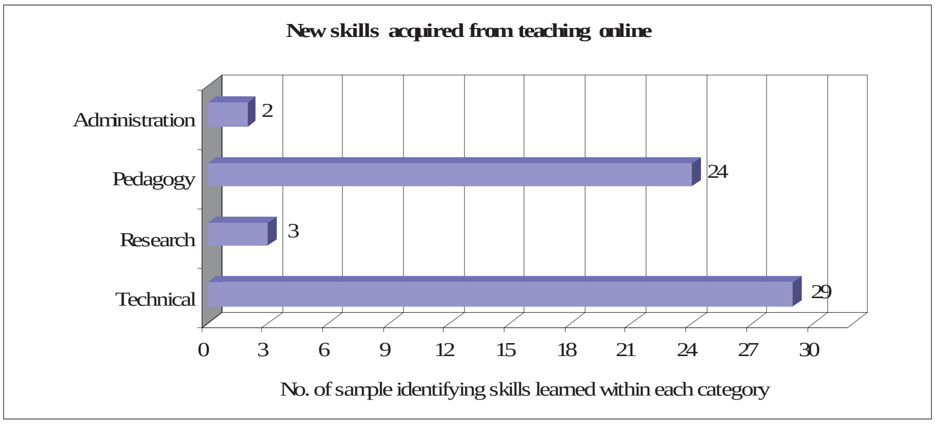

Figure 3: New skills acquired from teaching online

Administrative: Time management and organisation skills improved for a few respondents. Increased responsiveness to students' needs, and planning the course ahead of time was also stated.

Pedagogical: Most commonly mentioned were facilitation of discussion forums, development of self-directed and interactive learning activities. Some respondents explained that they tried to understand about the construction of learning, by carrying out a detailed analysis of tasks, in order to determine the steps involved in the design of an online learning activity.

Technical: A majority of respondents stated they had learned about LMS functionality. Some respondents had learned about HTML, digital images, file manipulation, Internet skills and improved their basic computer skills.

Research: Teaching in the online environment provided research opportunities for some respondents. Drawing from recent online experiences, they had learned new skills regarding public speaking for conferences, design of poster presentations and how to write funding grants.

Question 4: What new skills would you like to learn regarding online teaching practices?

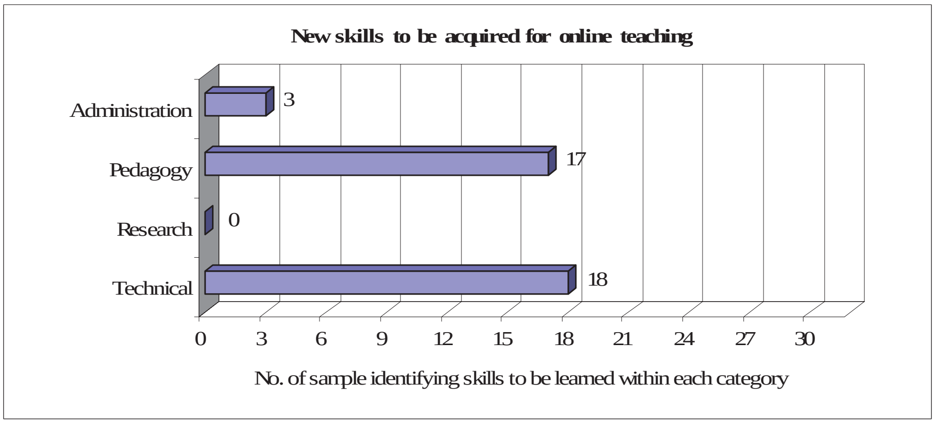

Figure 4: Skills lecturers would like to learn

Administrative: A few respondents wished to learn more about reducing their workload.

Pedagogical: A majority of respondents wanted to learn how to develop online assessments which required students to demonstrate analytical skills and understanding of theories, rather than answer multiple choice questions. Some wanted to develop advanced skills in effective discussion forum facilitation and group management. Others wanted to develop skills in course design for interactive online learning. Finally, some respondents wanted the opportunity to see and discuss examples of online teaching practices with their peers.

Technical: The largest response from respondents was to learn more about the online LMS functionality and more advanced computing skills. Some respondents wanted to learn about audio, image and animation files, online portfolios, digital narrative and e-library skills.

Question 5: Communication and scholarship related to online learning:

a. What have you done to learn from other lecturers and to share your insights with other lecturers?
b. What steps have you taken to apply the best available evidence to improve your practice?

Learning from others: A few participants said they gleaned examples of teaching practice from their colleagues. One participant saw a colleague using a video trigger in an online LMS and it made her think about creating a video narrative which could be used many times in her own courses. One participant stated the University website did not have enough 'best practice' examples.

Sharing with others: Half of the participants thought that talking informally with colleagues was a way of sharing teaching practices. One participant said she would like the opportunity to talk regularly with colleagues as they were the best source of ideas. A few participants published papers, gave conference presentations and participated in online forums.

Improving teaching practice: Little information was given about improving teaching practice, however self-critique, feedback from students, and trial and error were mentioned.

Discussion

Professional development undertaken

Discussion between peers, face-to-face workshops, one-on-one consultation and mentoring were the most useful professional development activities undertaken by lecturers. Each of these professional development activities may be carried out in an informal manner and provide the opportunity for spontaneous exploration, discussion and sharing between participants. In contrast, reading journal articles and books, and gaining qualifications in online learning were the least popular activities undertaken and considered the least useful. The academic rigor of these activities is demonstrated though the process of peer reviews for publication. Similarly, university qualifications undergo academic auditing procedures. While the University expects teaching to be informed by research, the top four professional development activities cited in this study do not have to undergo the same rigorous review process. Ramsden (2003) proposes that effective teaching is dependent on teachers connecting their teaching strategies to research however, these findings suggest lecturers do not perceive research activities as the most useful way of developing knowledge about online teaching practices.

Attending conferences, which rated highly as a professional development activity, rated lower for usefulness, however some lecturers said they published papers and gave conference presentations as a way of sharing online knowledge with others. Do lecturers make distinctions between the roles and benefits of presenting at a conference and attending a conference? Similarly, while lecturers used websites to access examples of online learning, they indicated that the websites were not at all useful, with one lecturer stating there were not enough examples of best practice on the university website. These findings suggest that the missing ingredient from these activities may be practical information and examples lecturers need to implement online teaching (Milne & White, 2005).

A strong finding was the request by lecturers for more opportunities to hold informal discussions and view examples of online teaching practices. This finding agrees with a study by Torrisi-Steele & Davis (2000) which found that lecturers asked for examples of online teaching practices. One of the lecturers saw a video trigger in a sharing of practice which gave her an idea for a video narrative her own online course. Lecturers who have a visual learning style might find that reading about a video trigger does not prompt the same response as seeing it working in action. Or perhaps lecturers find it difficult to conceptualise how the technology works, until it is demonstrated.

In summary, these findings concur with other studies which indicate that lecturers can benefit from collegial support, sharing experiences, ideas and examples (Ellis & Phelps, 2000; Mitchell et al., 2005; Torrisi-Steele & Davis, 2000). However in this study, lecturers have indicated that professional development activities which provide access to discussion between colleagues and examples of online teaching practice, are more than beneficial, they are seen as the most useful ways of developing knowledge about online teaching practice.

Skill development

Pedagogical: Many lecturers initially designed their online courses with a focus for involving students in self-directed and collaborative activities. Findings show they would like to develop further skills in designing interactive courses and learning activities, suggesting their online courses might not be as interactive as they would like. Although lecturers had learned how to create multiple choice questions in the LMS, they wanted to learn how to develop assessments requiring the demonstration of analytical skills and understanding of theory. This type of assessment is recommended by Phillips & Lowe (2003) who suggest online courses should include summative assessments which examine deep approaches to learning.

Through online teaching, lecturers had learned basic facilitation skills, however they wanted to facilitate student learning more effectively, i.e., advanced skills in effective discussion and group management. This suggests lecturers need more skills than they initially acquired to develop an online course and that facilitation of discussion forums and groups need to be more effective than they are presently. Once again, lecturers asked for opportunities to discuss and view examples of colleagues teaching practices.

Technical: The largest response was from lecturers who had learned basic LMS functions to build their courses and wanted to learn more about LMS functionality - presumably to make more use of the LMS environment which could increase the variety of online learning strategies. The second largest response was from lecturers who said they had increased their knowledge of basic computing skills through online teaching and wanted to learn advanced computing skills. While the term computing skill was not defined by lecturers, the university's professional development booklet describes computing skills as file management and Microsoft Office.

Other technical skills developed by lecturers were the manipulation of files, digital images, HTML and Internet skills, giving them the basics for designing and teaching in a LMS environment. Learning about and teaching with these basic skills, can give lecturers the confidence to experiment further - an early adopter trait (Wilson & Stacey, 2004). Accordingly, lecturers wanted to develop further skills in images, audio, animation, e-library skills, online portfolios and digital narratives. Online portfolios and digital narratives demonstrate that lecturers are keen to adopt technologies which provide alternatives to traditional learning strategies. This concurs with Ellis & Phelps (2000), who describe a professional development study where lecturers chose to learn about a variety of file types in order to create their own technology resources.

Research: While teaching in the online environment provided some lecturers the opportunity to develop research skills in making conference presentations, poster presentations and writing funding grants, none of the lecturers indicated a desire to develop these or any other skills further. This may be because the institution is a relatively new university yet to develop a strong research focus, or it may be a result of workload which was alluded to in the administration category.

Administration: Some lecturers had learned about course planning and providing timely responses to students, as well as improving time management and organisational skills. A few lecturers wanted to learn how to reduce their workloads. The development of an institutional policy for minimising online workloads is suggested as a useful professional development activity for lecturers to undertake (Ellis & Phelps, 2000; Mitchell et al., 2005).

Conclusions and recommendations

In this study, it would appear that early adopters perceive the development of *knowledge* about online teaching practices as the acquiring of practical skills, mainly in the technical and pedagogical areas. The professional development activities that early adopters identified as the most useful in developing these practical skills were discussion between peers, face-to-face workshops, one-on-one consultation and mentoring. These collaborative types of activities correspond with a common finding of this study, where early adopters asked for more informal opportunities to talk with colleagues and view examples of practice. This suggests that early adopters perceive professional development activities which promote the sharing of experiences and examples of practice, as the most useful ways of developing knowledge about online teaching practices.

In contrast, the findings suggest that early adopters found it less useful to read a journal article or book, or engage in a conference presentation about online teaching practices. This does not mean that these types of professional development activities are not engaged in or are ineffectual. However, these findings suggest that early adopters see the development of practical skills, in particular technical and pedagogical, as key in developing online teaching practices. The practical development of these new skills are best supported in collaborative environments, where examples can be demonstrated, strategies discussed and new ideas or technological products peer reviewed.

This paper recommends that more research be undertaken to determine how the less useful professional development activities identified in this study, in particular conferences and websites, could better meet lecturers' needs.

Another recommendation is that the acquisition of technical skills required for online teaching should not be limited to LMS functions, but should encompass a wide variety of hardware and software skills, i.e., computing skills such as file management, university supported standard software, Internet and multimedia along with relevant input and output devices. This combination builds technological knowledge, which provides lecturers with the capabilities to create and facilitate products which will ultimately be used by students to demonstrate deep approaches to learning, e.g., e-portfolios and digital story telling.

This study found that while early adopters were interested in designing interactive courses and assessment methods which promote deep approaches to learning, like many untrained teachers, they were only able to achieve this to a limited pedagogical level. Accordingly, early adopters indicated the desire to develop advanced pedagogical skills in order to design a more effective and interactive learning environment, as well as alternatives to traditional online assessment types. It is recommended that professional developers take advantage of early adopters being open to alternative strategies by promoting student-centred learning and authentic assessment approaches. For this University, the New Zealand E-Learning Guidelines would assist the nurturing of these approaches and aid the identification of best practice examples.

References

Bailey, M. (2002). *Transforming pedagogical practice*. http://education.ed.pacificu.edu/bcis/workshop/pedagogy.html [viewed 10 Sept 2005].

Ellis, A., & Phelps, R. (2000). Staff development for online delivery: A collaborative, team based action learning model. *Australian Journal of Educational Technology*, 16(1), 26–44.

Laurillard, D. (2002). *Rethinking University Teaching. A conversational framework for the effective use of learning technologies* (2nd Ed.). London and New York: RoutledgeFalmer.

Milne, J., & White, P. (2005). *E-Learning guidelines. Guidelines for the support of e-learning in New Zealand tertiary institutions http://elg.massey.ac.nz/Guidelines-questions.pdf.* [viewed 10 Sept 2005].

Mitchell, D., Clayton, J., Gower, B., Barr, H., & Bright, S. (2005). *Survey of e-learning experiences of tutors in New Zealand Institutes of Technology / Polytechnics*. Report presented to the Ministry of Education.

Phillips, R., & Lowe, K. (2003). Issues associated with the equivalence of traditional and online assessment. In G. Crisp, D. Thiele, I. Scholten, S. Barker & J. Baron (Eds.), *Interact, Integrate,*

Impact, Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (pp. 419-431). Adelaide, 7–10 December 2003.
Ramsden, P. (2003). *Learning to Teach in Higher Education* (2nd Ed.). London and New York: RoutledgeFalmer.
Rogers, E. M. (1995). *Diffusion of innovations* (4th Ed.). New York: The Free Press.
Torrisi-Steele, G., & Davis, G. (2000). "A website for my subject": The experiences of some academics' engagement with educational designers in a team based approach to developing online learning materials. *Australian Journal of Educational Technology*, 16(3), 283–301.
Waldron, N., Dawson, S., & Burnett, B. (2005). *Academic staff development in online learning and teaching: developing online pedagogies*. http://ausweb.scu.edu.au/aw05/papers/refereed/waldron/paper.html [viewed 10 Sept 2005]
Wilson, G., & Stacey, E. (2004). Online interaction impacts on learning: Teaching the teachers to teach online. *Australasian Journal of Educational Technology*, 20(1), 33–48.

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Using the internet for professional development: The experience of rural and remote professionals

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The retention of professionals employed in rural and remote areas of Australia is a critical factor in community growth and sustainability. Retaining professionals depends to a large extent on the availability of support and professional development that is becoming increasingly accessible through the internet. This paper describes a research study that used survey and interview methods to indicate how a range of ten professional groups employed in rural and remote Australia, are accessing the internet for professional development. The findings indicate that email, the world wide web, discussion, chat and listservs were commonly used, however, the ability of professionals to avail themselves of professional development support on the internet was not always within their own control, and depended on a number of complex factors.

Keywords: internet, professional development, rural and remote professionals

Introduction

Isolation and lack of professional support is a factor in many professionals' decisions to abandon teaching, nursing, physiotherapy, dentistry and a range of other professions (Human Rights & Equal Opportunity Commission, 2000; National Rural Health Alliance, 1998). It is easy to imagine that the internet could revolutionise the way professionals in remote and rural areas of Australia access, and participate in, professional development activities.

The affordances of the internet now readily enable the downloading of information and recent research papers, written communication between colleagues, videoconferencing and voice communication, and a range of other services and facilities that should ameliorate the professional isolation that afflicts professionals throughout rural and remote Australia. The innovative use of information communication technologies to deliver online support, professional development and resources should readily help to remove any sense of professional isolation. In so doing, it could have a positive effect on professionals' morale, reduce attrition, and decrease government costs in the provision of services. Retaining able and experienced professionals in rural areas should help provide long-term benefits to the rural economy.

In this paper, we describe a survey study conducted to explore the extent and nature of professional isolation in rural and remote regions of Australia, and the use of the internet to support professional development needs. The study drew upon survey and interview data from 10 professions, and the findings and recommendations are based on the views and experiences of over 1200 respondents.

Examination of the data allows a picture to emerge of rural and remote professionals' use of the internet for professional development—who is learning and the technology they are accessing. The paper describes the level and extent of use of the internet for professional development, and the types of internet tools used by professionals on a daily basis.

Background

Because of widespread concern that reduced outcomes in health, education, employment and technology in rural Australia have the potential to undermine national cohesion (House of Representatives Standing Committee on Primary Industries & Regional Services, 2000; Regional Australia Summit Steering Committee, 2000) strategic support for rural and regional areas has become a national priority (Anderson, 2001). Attracting and retaining professional and para-professional staff in rural areas is recognised as a significant factor in improving many of these outcomes. Compared to their metropolitan counterparts, rural communities face a number of reduced health outcomes. These include higher mortality rates, higher incidence of cardiovascular disease, preventable accidents, cancer and diabetes, higher rates of youth suicide, higher rates of hospitalisation and reduced access to GPs, nurses, midwives, pharmacists, dentists and other allied health professionals (National Rural Health Alliance, 2001).

Similarly, educational outcomes are reduced for rural compared to metropolitan communities. Schools in rural Australia experience a higher turnover rate of staff than metropolitan schools (Tomlinson, 1994). A high turnover of inexperienced staff results in schools lacking stability and program continuity, with clear disadvantages for students (Human Rights and Equal Opportunity Commission, 2000). The commission has documented the reduced quality of educational outcomes achieved by rural students in respect of literacy, numeracy, retention rates and participation in higher education.

While there are a number of factors that influence these outcomes, a significant one appears to be the shortage of able and experienced professionals employed in rural communities (House of Representatives Standing Committee on Primary Industries and Regional Services, 2000; Human Rights and Equal Opportunity Commission, 2000; American Association of School Administrators, 1999). This problem is widespread across many different professional groups such as medical practitioners, nurses, allied health professionals, dentists, and pharmacists (National Rural Health Alliance, 2001), teachers (Collins, 1999), speech therapists (Foster & Harvey, 1998), and social workers (Lonne & Cheers, 2000).

Recruiting and retaining professionals in rural areas

In recognition of this concern, State and Federal governments have introduced a number of initiatives to recruit professionals to rural areas. For example, incentives to attract practising teachers include preferential treatment for transfers; additional annual leave; monetary allowances, repaying HECS liabilities and subsidised housing. Other approaches have aimed specifically at attracting suitable pre-service teachers by recruiting them from rural areas; providing practicum placements in rural areas and offering pre-service modules that provide information about teaching in rural and remote areas (Human Rights and Equal Opportunity Commission, 2000). In the health area, strategies have been developed to attract health specialists to rural areas including scholarships, grants, specialist rural posts, training programs and locum programs (Regional Australia Summit Steering Committee, 2000) and recruitment from rural areas (Rabinowitz, Diamond, Markham, Nina & Paynter, 2001).

While there are initiatives in place to *attract* professionals not enough research attention is being given to determining effective ways to *retain* them (Collins, 1999; Murphy & Angelski, 1996; National Rural Health Association, 1998). There are many reasons to explain the differential employment patterns of professionals in rural as compared to metropolitan communities. The reasons why rural and remote schools are difficult to staff include a number of disincentives such as travel costs, higher costs of living, and limited accommodation.

An important disincentive appears to be lack of access to professional development, in particular, decreased contact and support from fellow professionals and administrators (Human Rights and Equal Opportunity Commission, 2000; Collins, 1999; Foster & Harvey, 1998; Hoover, & Aakhus, 1998; Westling & Whitten, 1996). Similarly, doctors and dentists do not take up rural practices because of the lack of professional support and development, as well as factors such as: lower earning capacity; and lack of employment, health and educational opportunities for spouses and children (National Rural Health Alliance, 1998). Some specialist areas of health care experience critical issues of recruitment and retention.

The potential benefits of professional development and support through ICTs

More adequate professional development and support could help remove the sense of isolation faced by professionals working in rural Australia, and could have a positive effect on their decisions to remain in rural communities. The benefits of developing and implementing professional development and support resources have been recognised in a number of government reports.

The innovative use of information and communication technologies (ICTs) is argued by a number of researchers as a viable option for providing professional development and support for rural professionals in the areas of health (e.g., Striffler, & Fire, 1999; Sykes, & McIntosh, 1999). Banks and Togno (1999) suggest that Telehealth can provide opportunities for teleconsultation, telemonitoring and teleinformation.

They argue that of these, teleinformation has the greatest potential for rural health care workers, and suggest that email for communication between clients and other professionals, and the use of the World Wide Web in accessing information, are essential skills needed by rural health carers.

Overseas, the National Rural Health Association (1998) in the United States argues that although much effort has been expended in placement of physicians in rural areas, relatively little has been done to enhance their retention. The association argues that professional isolation is often a reason to leave a rural area and, as in Australia, the association suggests that innovations in information technologies such as the internet and teleinformatics can become resources for diminishing this isolation.

In a strategy that parallels that proposed for retaining health professionals, the Northern Territory Government in its submission to the House of Representatives Standing Committee on Primary Industries and Regional Services (2000) recommended the innovative use of information technologies in reducing professional isolation of teachers.

> Adequate communications services will enable schools to provide appropriate levels of education and assist to remove the sense of isolation for staff. Internet access for teachers in remote areas would enable the electronic delivery of course material, professional development and on-line assistance…The provision of adequate communications as well as other infrastructure can have a positive impact on staff morale and a consequent reduction in the high staff turnover rates in remote community schools. This would have an overall effect of reducing the cost to Government of providing educational services to remote areas (p. 267).

The research study

In order to assess the extent and nature of the use of the internet to support professional development, a study was conducted:

- To identify the *level* of professional development and support that is available through the internet to professionals working in rural Australia
- To assess the *use* of professional development and support that is available through the internet to professionals working in rural Australia
- To identify the perceived *needs* and *benefits* of professional development and support that is available through the internet to professionals working in rural Australia

Methodology

The methodology comprised extensive consultation and a literature review, a review and analysis of professional development websites, a survey of over 1200 rural workers in 10 professional areas in two states of Australia, and selected interviews. Each data source and method of analysis is described below:

Website review

A review of professional development websites was conducted to assess the systemic online support offered by professional organisations to their members (such as the *Australian College of Educators'* website, the *Australian Medical Association* website, etc.). English language websites in Australia, New Zealand, UK and USA were sourced on advice from consultations with professional bodies, from the literature, from links provided within other professional websites and from general web searching using browsers such as *Google* and *AllTheWeb*. The websites were analysed for the types of knowledge building services they provide, support services, information sharing opportunities, and the communication tools and resources offered. The data was assembled in tables to allow easy comparison of the forms of professional support provided in each site.

The survey

Professionals working in rural areas of Western Australia and Queensland were selected for the survey in the study. These states were chosen as they both have large remote areas with geographically dispersed rural communities, and both have a long history of responding to the special needs of these communities (as evidenced for example, by both states' extensive distance education and health initiatives). Professionals were chosen on the basis that they would be service professionals working in remote and rural areas of Australia and were selected from three 'sub-major', 'minor' and 'unit' groups of professionals listed in the *Australian Standard Classification of Occupations* (Australian Bureau of Statistics, 1997). Ten professional groups were selected for in-depth study (Column 3 of Table 1 below).

Table 1: Professionals chosen by Australian Standard Classification of Occupations

Sub-Major Group	Minor Group	Unit Group
Health Professionals	Medical Practitioners	General Medical Practitioners
	Nursing Professionals	Registered Nurses
	Miscellaneous Health Professionals	Dental Practitioners
		Pharmacists
		Occupational Therapists
		Physiotherapists
		Dieticians
Education Professionals	School Teachers	Primary and Secondary School Teachers
Social, Arts and Misc. Professionals	Social Welfare Professionals	Social Workers
		Psychologists

The professionals were contacted by mail via the relevant government agencies which included the Education Departments of Western Australia and Queensland, and the Health Departments of Western Australia and Queensland. An anonymous postal questionnaire was developed and sent to selected professionals identified as working in a rural area. Rural and remote areas of Western Australia and Queensland were operationally defined by postcode, using the *Accessibility/ Remoteness Index of Australia* (ARIA) (Department of Health and Aged Care, 1999) developed by the *National Key Centre for Social Applications of Geographical Information Systems* (GISCA) at the University of Adelaide. The number of professionals surveyed, and the response rates are shown in Table 2.

Table 2: Numbers of professionals surveyed and questionnaire response rates

Profession	WA	QLD	Total	Returned	% Return
Dentists	120	110	230	50	22
Dieticians	12	4	16	8	50
Doctors	180	351	531	77	15
Nurses	1180[A]	1918[A]	3098	330	11
Occupational Therapists	79	224	303	80	26
Pharmacists	77	95	172	19	11
Physiotherapists	60	342	402	105	26
Psychologists	83	65	148	46	31
Social workers	135	0[B]	135	25	19
Teachers	3513	2352	5865	527	9[C]
TOTAL	**5439**	**5461**	**10790**[D]	**1267**	**12**

A. 50% random sample (because of very large numbers)
B. This group was not included, as surveys were not posted out as intended
C. This is a conservative estimate as each school surveyed relied on the approval of individual school principals
D. 10900 less 95 'returned to sender' and 15 'other' professionals

Questions within the questionnaire sought to elicit information on:

- demographic data (e.g., age, qualifications, period of employment)
- needs, awareness, use and accessibility of professional development and support that uses the internet
- perceived IT competence
- benefits/drawbacks of professional development and support that uses the internet
- beliefs about the impact of the internet in ameliorating professional isolation
- perceived barriers to using the internet.

Questionnaires were returned to the researchers in post-paid envelopes. All data was coded by questionnaire item number and entered into the SPSS (*Statistical Package for the Social Sciences*) statistical analysis program. It was analysed using descriptive statistics, and graphically represented using bar charts and tables. As the study did not aim to make state-by-state comparisons, the data was not analysed or reported by state.

The interviews

While the survey was anonymous, one part of the questionnaire asked respondents to provide a name and telephone number, if they were willing to provide further information through interview. The purpose of the interviews was to probe in depth the issues and concerns raised in the initial survey. A general schedule of interview questions was used in the semi-structured interviews, but specific issues described in individuals' questionnaire responses, and further follow up issues resulting from participants' comments, were also explored in depth in the interviews. Questions included:

- What forms of professional development do you usually undertake?
- Do you feel adequately supported in your profession?
- Is the internet important for your professional learning? Why? Is it better than other approaches? What does it overcome?
- What would you like to see happen that would improve the way the internet could be used for your professional learning? Extra training? Better web site designs? Better technologies?
- [Is there any significant point that is highlighted on their questionnaire response that could be followed up?]

Twelve in-depth interviews were conducted with the rural professionals who agreed to provide further information. Interviews lasted between 20 and 40 minutes each. Interviews were transcribed for analysis. Themes and issues of concern were identified using the process of *data reduction*, *data display*, and *conclusion drawing and verification*, described by Miles and Huberman (1994). The data analysis of both the surveys and the interviews, sought to examine in detail the effectiveness of the internet in overcoming professional isolation, with an emphasis on: assessing rural professionals' *use* of web-based professional development and support resources; identifying professionals' perceived *benefits* of web-based professional development and support resources; and identifying professionals' perceived *needs* for web-based professional development and support resources. In particular, the data collected on professional use of the internet and the types of internet tools and functions used by the ten professional groups is reported here.

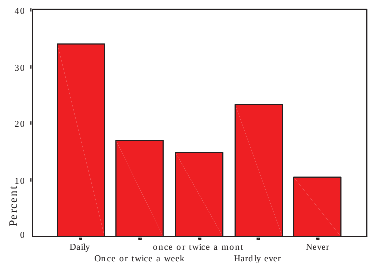
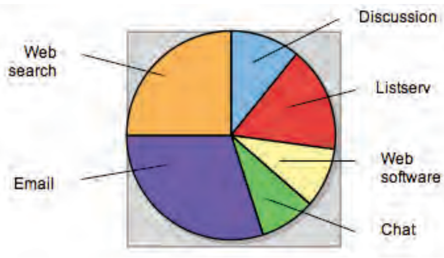
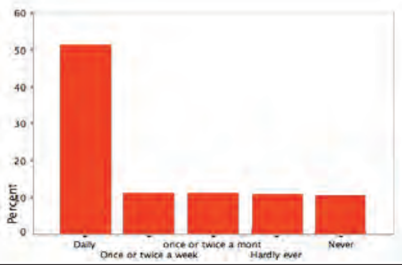
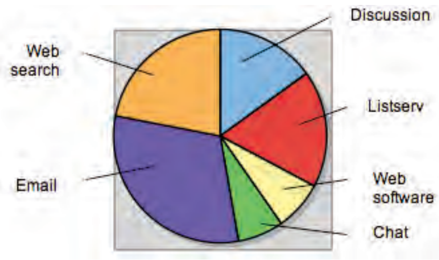
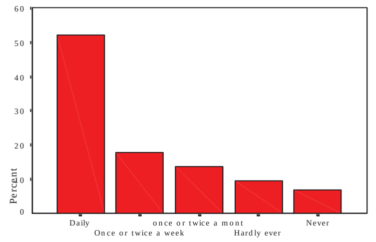
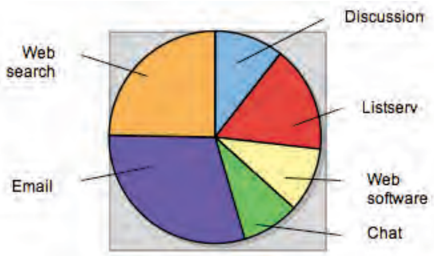
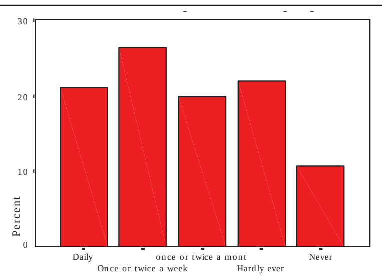
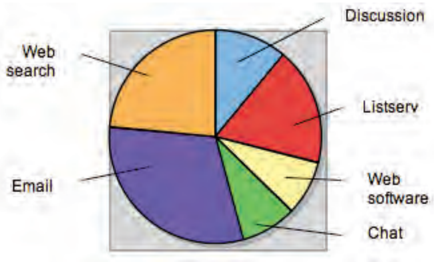
Findings

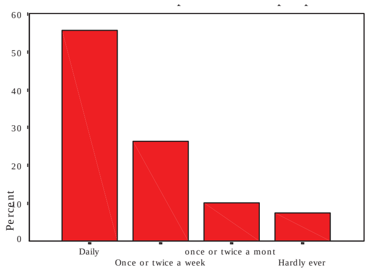
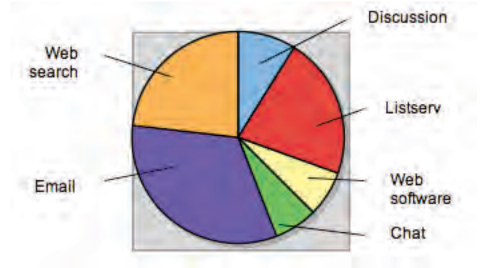
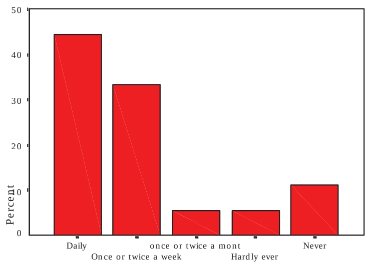
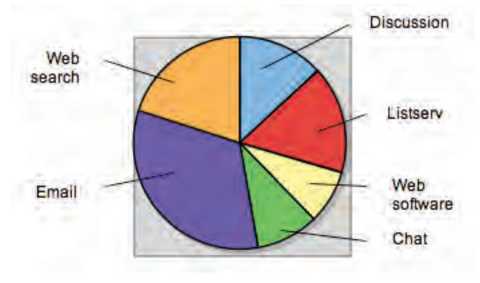
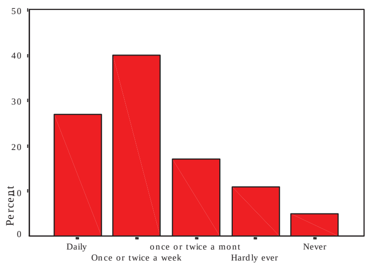
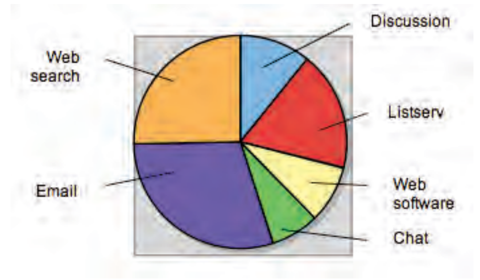
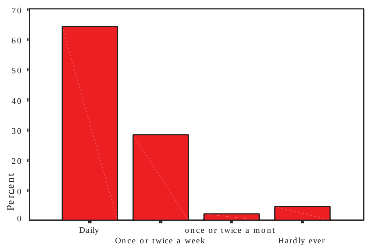
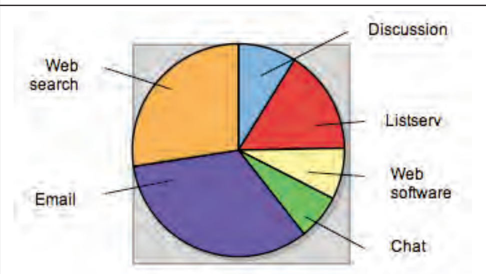
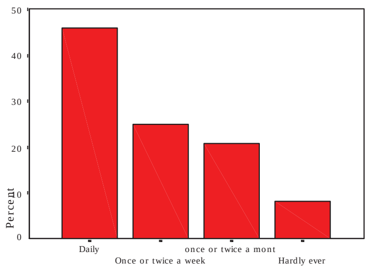
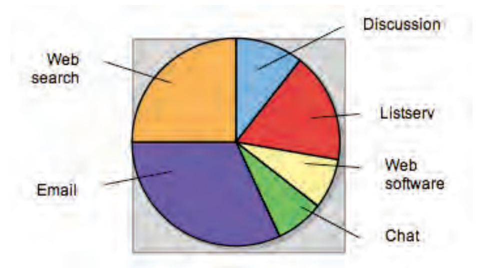
Concise findings of the study are presented here because of space restraints. A detailed report of the study is currently in press and will be published by the Rural Industries Research & Development Corporation (RIRDC).

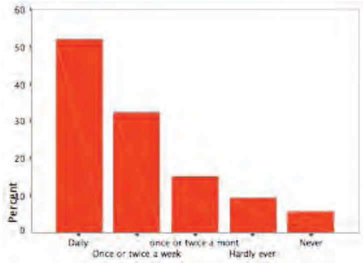
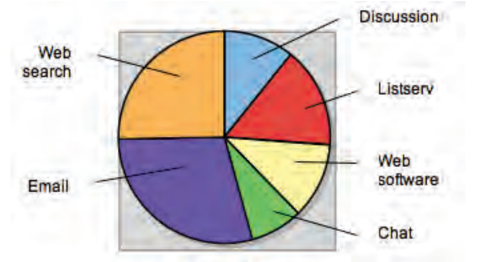
The findings of the research revealed some extreme cases of physical and professional isolation. For example, a social worker in Western Australia pointed out that he or she is: '[The] only social worker in health and community development in a geographical area three times the [size of] the state of Victoria'. Not all professionals felt unsupported, as many worked in schools and hospitals with a number of other co-workers.

Nevertheless, there was much evidence to suggest that internet technologies are used extensively by all the professions surveyed to extend and support their professional activities. Table 3 summarises the use of the internet by profession, together with the current use of internet tools, and the professionals' suggestions on how the internet assists with their professional learning.

Table 3: Frequency and use of the internet for professional development, by profession

Who's learning? Who is using the internet for PD and how often? (*Daily* to *Never* use, left to right)	**Whose technology?** What is the current use of internet tools by professionals?	**Uses** How the internet helps in professional learning
Dentists		
		Seminars, courses, online lectures Resources - published papers Advice, FAQs, online mentoring Networking and support for professional relationships
Dieticians (small no. of respondents)		
		Access to resources Publications, information, and research reports Professional development courses and continuing education
Medical practitioners		
		Access to resources Training Communication Networking and support for professional relationships
Nurses		
		Resources Information on medications Practice protocols Continuing education self-directed learning Advice, FAQs, online mentoring Communication, networking

<table>
<tr><td>Occupational therapists</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Access to resources - evidence-based practice resources
Access to case studies
Information on a condition or diagnosis
Training - online courses</td></tr>
<tr><td>Pharmacists</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Training - lectures online, city-based programs
Access to resources
Professional information (e.g., changes to the pharmacy and poisons act)
Communication with colleagues</td></tr>
<tr><td>Physiotherapists</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Access resources
Update knowledge on syndromes
Protocols, pathways, and handouts for patient care
Training - journal clubs, business skills
Professional discussions</td></tr>
<tr><td>Psychologists</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Resources
Treatment guidelines and education material for clients
Training to upgrade qualifications,
Advice and online mentoring
Networking</td></tr>
<tr><td>Social workers</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Access to resources (e.g., access to e-journals)
Training – such as e-supervision
Online post-graduate education
Communication, networking</td></tr>
</table>

<table>
<tr><th>Teachers</th><th></th><th></th></tr>
<tr><td>
</td><td>
</td><td>Sharing of teaching ideas
Program resources
Teaching resources
Publications
Ideas and downloads
Online training such as post-bachelor degrees.</td></tr>
</table>

These data reveal that the internet is accessed substantially by the majority of groups for professional purposes. Only teachers, psychologists, and medical practitioners could claim to more than half their numbers accessing it daily. Nevertheless, few professions had large numbers of practitioners who *never* used the internet. Pharmacists, dentists and nurses had the most substantial numbers in this regard, although as pointed out by one pharmacist, the nature of his or her daily work (i.e., running a busy shop front) largely prohibited access to the computer during the day.

In terms of the types of internet tools and functions accessed by professionals, as might be expected, email and web search engines comprise more than half the uses for most of the professions. Of the remainder, discussion boards and chat sessions for professional purposes were found uniformly across the professions. Listservs were also used by all the professions. All professions also had healthy numbers who used web software (such as *Dreamweaver*), and while this survey item included web publishing tools such as blogs and wikis, it must be said that at the time of the data collection (2004), few professional reported that they used these functions of the internet for professional purposes.

The broader study showed that while a great deal of web-based information and support was available for all the professions studied, professionals were generally aware of the types of support available. However, the reliable access to, and use of the internet to support professional development was a much more inconsistent finding amongst the professionals studied. The ability of professionals to avail themselves of professional development support on the internet was not always within their own control, and depended on a number of complex factors:

A time and place for professional development
The increasingly time-poor status of professions and the difficulty of achieving a satisfactory work/life balance was a repeated theme throughout the responses received from across the professions. Finding the time for professional development is seen as necessary but problematic. Often professional development is only offered in metropolitan areas where problems of distance and travel cost can make attendance difficult. Using the internet for professional development competes with daily duties because there is no physical separation from daily work or home to allow dedicated attention to such issues.

Access to the internet
While most professionals surveyed in this study had access to the internet either at home or at work, the quality of access varied considerably. While some professionals had individual computers and free and unlimited access to websites and resources, for most, various factors intervened to the point where access was sporadic or limited. Some professionals were limited by their employers to sites only available on an intranet, with no access to outside websites. The number of computers able to access the internet was also a major factor in accessibility: while many workplaces had internet connections the number of computers in many of the locations was far fewer than the number of employees, with many professionals sharing computers or waiting their turn. Some professionals were denied access to the internet at all times at their workplace, and any professional development on the internet was done in their own time at home.

Internet reliability
Frequently, rural and remote professionals were plagued with unreliable connectivity resulting from the use of superseded computers, power surges and outages, server unreliability and computer viruses. Many professionals also admitted to their own lack of computer literacy and knowledge of more than basic computing strategies and skills.

Benefits of the internet
In spite of these identified problems, professionals in rural and remote areas of Australia generally recognised the potential benefits of the internet in providing for some of their professional development needs. Especially for beginning professionals in rural and remote areas of Australia, access to resources relevant to their own profession was an issue of paramount importance. Access to codes of practice and policy documents would help beginning professionals to more readily learn what it means to be a professional in each area. Most professionals expressed a need for resources and information that relate directly to their practice. Downloading information and resources was the most common use of the internet among the professions. The survey responses highlighted the need to access the latest research in their field through professional online journals.

Most professionals value face-to-face professional development activities but the large distances and high costs of travel in some cases is prohibitive. The internet was perceived as an environment that could offer online courses, seminars, lectures for postgraduate qualifications and credit points for professional continuing accreditation. Many professionals requested online professional development that matched the face-to-face activities found in metropolitan areas. As well as training in areas of their profession, many indicated the need for training in computer–based skills. Email was the most commonly used means of maintaining professional contact. Professional contact through listervs was also recognised as a simple and convenient means of engaging in professional conversation, and a means of receiving professional support and advice, and professional supervision where this is a requirement. Many professionals also indicated the need for online mentoring and communication with more experienced colleagues.

Conclusion

Continual learning is vital for professionals to ensure that they stay up-to-date with current developments in their field, and they stay in touch with the practice of their craft. This is particularly important for individuals who are isolated, either geographically or professionally, through placement in rural and remote locations throughout Australia.

But who is learning? This study has shown that the internet has the potential to not only provide a vast array of resources to professionally isolated rural and remote professionals in Australia, but also to provide the means to more enhanced communication, collaboration and community building. Whose technology? Arguably, the technology is not yet totally in the hands of the practitioners. Current technological, institutional and social constraints associated with the use of the internet as a professional development tool, need to be addressed before it can more fully serve the development needs of rural professionals, and the communities and citizens they serve.

In effect, a range of practical, bureaucratic, managerial and technological factors intervene, on a day-to-day basis, to impede the effective use of the internet to resolve inadequate and unfair professional development opportunities across regional and remote areas of Australia.

References

American Association of School Administrators. (1999). *AASA online advocacy*. http://www.aasa.org/government_relations/ [viewed 10 July 2006].
Anderson, J. (2001). *Stronger regions, a stronger Australia*. Canberra: Commonwealth of Australia.
Australian Bureau of Statistics. (1997). *The Australian standard classification of occupations* (2nd Ed.). Canberra: Australian Government Publishing Service.
Banks, G. & Togno, J. (1999). Telehealth in Australia: Equitable healthcare for older people in rural and remote areas. *5th National Rural Health Conference*. Adelaide. http://www.ruralhealth.org.au/ [viewed 10 July 2006].
Collins. T. (1999). *Attracting and retaining teachers in rural areas*. www.ael.org/eric/digests/edorc997.htm [viewed 10 July 2006].
Department of Health and Aged Care. (1999). *Accessibility/remoteness index of Australia (ARIA)*. Canberra: Commonwealth of Australia.
Foster, F., & Harvey, B. (1998). The recruitment and retention of speech language pathologists in rural Canada: Solutions to problems in the field. *Guidance and Counselling*. 13(2), 22-27.

Hoover, J.H., & Aakhus, B.P. (1998). *Staying, leaving, and job satisfaction in a rural/remote state: A matter of roots*. 9 pp. ED417891
House of Representatives Standing Committee on Primary Industries and Regional Services. (2000). T*ime running out: Shaping regional Australia's future. Report of inquiry into infrastructure and the development of Australia's regional areas*. Canberra: The Parliament of the Commonwealth of Australia.
Human Rights and Equal Opportunity Commission. (2000). *National Inquiry into Rural and Remote Education (Australia): Emerging Themes*. Sydney: Author.
Lonne, B., & Cheers, B. (2000). Personal and professional adjustment of social workers to rural and remote practice: Implications for improved retention. http://www.mala.bc.ca/ruralconf/blonne.htm [viewed 10 July 2006].
Miles, M.B., & Huberman, A.M. (1994). *Qualitative data analysis* (2nd. Ed.). Thousand Oaks, CA: Sage.
Murphy, P., & Angelski, K. (1996). Rural teacher mobility. *Rural Educator,* 18(2), 5-11.
National Rural Health Alliance. (2001). *2001 Election Charter.* http://www.ruralhealth.org.au/ [viewed 10 July 2006].
National Rural Health Association. (1998). *Physician recruitment and retention*. www.nrharual.org/dc/issuepapers/paper13/html.html [viewed 10 July 2006].
Rabinowitz, H.K., Diamond, J.J., Markham, F.W., Nina, W. & Paynter, P. (2001). Critical factors for designing programs to increase the supply and retention of rural primary care physicians, *The Journal of the American Medical Association,* 286(9), 1041-1048.
Regional Australia Summit Steering Committee. (2000). *Final report* http://www.regionalaustralia.gov.au/summit/outcomes/final_report/index.htm [viewed 10 July 2006].
Striffler, N. & Fire, N. (1999). Embedding personnel development into early intervention service delivery: Elements in the process. *Infants and Young Children,* 11(3), 50-61.
Sykes, D. & McIntosh, W.A. (1999). Telemedicine, hospital viability, and community embeddedness: A case study. *Journal of Healthcare Management.* 44(1). 59-71.
Tomlinson, S. (1994). *Schooling in rural Western Australia. The ministerial review of schooling in rural Western Australia.* Perth: Education Department of WA.
Westling, D.L. & Whitten, T.M. (1996). Rural special education teachers' plans to continue or leave their teaching positions. *Exceptional Children,* 62(4), 319-335.

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Innovation through action learning

Beth Hobbs, Paula Williams, Louise Turnbull
TAFE NSW Western Sydney Institute – OTEN
Educational Development – Learning Technologies Unit

This paper describes an organisational approach that is being undertaken by a vocational educational institution to engage teachers in the use of emerging technologies to enable them to implement innovative ways of teaching and learning that are more flexible and accessible for learners. The approach incorporates large scale innovative professional development opportunities for vocational teachers involving action learning project teams exploring the potential benefits of emerging technologies and trialling the use of these technologies with learners. The outcomes will impact on organisation wide decisions about the future direction of collaborative learning environments and technologies to support teaching and learning. These projects are part of a state-wide TAFE NSW dynamic research teaching and learning community, continuously collecting practitioners' ideas, experiences and information then sharing, organising and evaluating them. Using action research methodology the projects focus on what the teachers' experience, the outcomes for learners and the technical challenges embraced. This approach aims to collect meaningful applications of learning strategies using technologies that are effective, sustainable and scaleable.

Keywords: emerging technologies, teaching and learning strategies, teachers' learning, learning communities, collaborative learning, social software, Web 2.0, action learning, action research

Introduction

Each new wave of technological innovation promises to revolutionise education. Currently we are hearing about the potential of multimedia and elearning to transform the way we teach and learn (Meijas, 2005). It's relatively easy to incorporate new technologies into the learning process if the goal is to merely replicate the traditional ways of doing things without significantly impacting on existing teaching practice. The exciting challenge is to employ technology to enable learning in ways that could not be done using traditional methods. This paper reports on a work in progress where teachers are being engaged not only in learning how to use various mobile devices and social computing tools but also reflecting on and discussing learning theories and pedagogies. This will inform development of action strategies to implement innovative change in their teaching practice. This action research project is highlighting that the real challenge is to create new teaching and learning paradigms based on the possibilities afforded by these new tools rather than focussing on how to operate them.

The project utilises an action research methodology, which is a well-established practice-based approach to developing educational practice and theory and is closely connected with the 'reflective practitioner' tradition (Schon, 1983). This approach is used in combination with an action learning approach to the exploration of emerging technology trends and tools, where a group of teachers come together regularly to help each other to learn from their experience (Dick, 1997). This approach is enabling the project teams to be actively involved in learning and research. This will facilitate understanding, which then informs action in changing teaching practice, which will then in turn lead to further learning and research – a cyclical approach of learning, research and evaluation.

Emerging trends and the implications for VTE educators

According to the recently published *2006 Horizon Report* (New Media Consortium, 2006) there are a number of key trends currently emerging in the use of technologies in education. The two key trends that the project teams are addressing are: "Dynamic knowledge creation and social computing tools and processes are becoming more widespread and accepted" and "mobile and personal technology is increasingly being viewed as a delivery platform for services of all kinds" (New Media Consortium, 2005, 3).

Mobile phones, PDAs, MP3 players, wikis and blogs all have the potential to offer new ways of contacting, teaching and assessing learners' progress. The extent to which the new technologies make a significant impact on teaching and learning delivery is predicated on how well the teacher understands the technology, its uses and the suitability of content to be delivered using these methods. Along with action learning and research methodologies, comprehensive evaluations of time spent, the cost of investing this time and an appreciation of how else the content can be taught will be undertaken to ensure sustainability.

With the development of networks and international collaborative associations there has been an increase in the opportunity for research and development, especially in the field of m-learning. To date only a small proportion of educators have had an opportunity to implement m-learning in mainstream educational delivery. Keegan (2005), at Mlearn 2005, noted that "it is now time for mobile learning to emerge from its project status and enter into mainstream education and training".

It is critical that teachers and managers, especially within traditional learning delivery areas, understand that technology is here to assist, and be part of, a range of flexible delivery options. Good teaching practice is creative, it motivates, excites and inspires. The adaptation of society's well used and attractive technologies to an appropriate learning context has huge potential for the learning practitioner's kit of creative practice. We do need to always consider the learner's needs and access to the technologies, but not make that a limitation to the options available.

The approach 'a paradigm shift'

TAFE NSW Western Sydney Institute (WSI) has developed an approach that allows teachers to not only explore new technologies and pilot these with students but also encourages them to re-think the teaching and learning processes and their practice. The teachers involved in these trials will use various mobile devices and social software tools to engage learners.

While there is a recognised digital divide between an ageing VTE teaching force and students, it is critical that teachers be supported and encouraged to re-evaluate their teaching practice to include new technologies that will engage the Net g learners of today. The action learning teams in this initiative will undertake projects that encourage the participants (teachers) to critically reflect and question the pedagogical principles currently being used in vocational training and education.

According to Siemens, significant trends in learning are important for educators to reflect on and engage with. Siemens states that "Connectivism provides insight into learning skills and tasks needed for learners to flourish in a digital era" (Siemens, 2005).

How does a large vocational institution engage teachers in reflecting on new learning theories that embrace the incorporation of emerging technologies to support learning? This project has adopted a range of strategies to ensure a strategic approach to supporting and engaging teachers in innovative approaches to their teaching practice.

Organisational strategy with action teams

The Learning Technologies Unit staff are working with a range of teachers that are connected state-wide through initiatives like LearnScope and TAFE NSW Online. LearnScope is a national professional development project that helps participants learn to use flexible delivery approaches such as elearning in vocational education. The TAFE NSW LearnScope project team has been investigating how the skills and knowledge gained through their professional development projects are subsequently applied in ways that benefit clients. TAFE NSW Online is a comprehensive state wide project aimed at ensuring TAFE teachers have the support and expertise required to increase flexible delivery options to students and industry clients. One of the sub-projects within this initiative focuses on action learning teams exploring and evaluating new and emerging learning technologies.

Each action learning project team within WSI is a 'node in the network', with the network stretching across TAFE NSW. This networked community of vocational teachers are experiencing, through action learning, what it is like to use collaborative social software and web 2.0 tools in teaching and learning. The challenge in previous projects has been how to disseminate findings and outcomes to ensure wider uptake and interest across the organisation. Web 2.0 services or the Read Write Web is a form of collaborative reporting and communication that can assist this process. The project teams are encouraged to make use of a wide range of innovative approaches to capture and share team learning rather than use traditional reporting mechanisms that have the potential to sit unread on desks.

Table 1: Action learning project teams for Western Sydney Institute

Project team	Professional development focus	Status of project and range of emerging technologies
Blog2Blog ConnecTVETy	Up skill VTE teachers technical skills in the functions and features of Web 2.0 for delivering VTE HSC courses for schools.	Having been exposed to a range of educational technologies and social software applications. Team members are now developing the appropriate uses of these technologies into their TVET programs and trialling with their students.
LiFE Learning in the Field	Develop skills to use technology effectively in the field. Exploring the benefits of these technologies for the outdoor environment.	Using digital recording devices to collect evidence-based assessments in the field, such as images, audio, video using PDA's, MP3's and 3G phones.
Audiodynamism	Develop digital recording skills to create and retrieve audio material using a wide range of current web 2.0 tools for student assessments in conjunction with social software applications.	Developing learning activities that incorporate podcasts and blogs to their specialised field of practice. Having investigated the features and functions of MP3, Audacity, Podomatic, Audioblogger, Odeo and other Web 2.0 services to connect with their learners.
IT Richmond	Up skilling teachers in the use of web based technologies to demonstrate competencies with students remotely.	Creating audio lectures for MP3 players, providing online work based learning environments for the delivery of a practical level 3 qualification. Implementing evidence based assessments methods using digital recording devices.
Walk through country	Develop skills in the usage and capabilities of mobile handsets, to demonstrate new ways to facilitate and promote student learning and engagement	General vocational education teachers are exploring the potential benefits for evidence based assessment in the workplace. Using 3G mobile phones for capturing evidence via blue tooth, moblogging and videoblogging.
C&J Nirimba	Exposing teachers working with apprentices on site with suitable mobile technology devices to record evidence of students learning using both voice and images.	Conducting site visits with suitable technology i.e. PDA's and MP3's to record voice and images that are currently collected and assembled on eportfolios to be retrieved later as evidence.

Qualitative method for reporting

The qualitative methodology for collecting evidence from project teams incorporates web based communities/networks involving the following applications:

- blogs to reflect on professional development and outcomes
- podcast interviews and conversations reflecting teachers learning
- collaborative online discussions between teams using Wikis
- progress reports using online postcards
- showcasing and sharing project outcomes to institute and state-wide groups
- online surveys
- webcast tools e.g. Breeze to document live workshop sessions for sharing across teams.

Wider engagement

Making connections with WSI staff to share and leverage off what the WSI and TAFE NSW wide teams discover through their projects is critical to the longevity of incorporating emerging technologies in innovative teaching practice for the institute. The strategies being used to do this include those shown in Table 2.

Table 2: Strategies to incorporate wider engagement

Intranet space	Online newsletter for all WSI staff	Share point team site	Professional development
A comprehensive up-to-date site that contains learning resource links as well as showcasing innovative strategies developed by WSI teachers as well as national and international examples.	Published each term online incorporating articles updating staff on current online support systems, progress reports on technology trials, feature article of an innovative teacher or team of teachers presented as a podcast and links to current up-to-date relevant articles and case studies.	The use of Share Point application to create collaborative team sites easily accessed through the WSI staff intranet for all project teams involved in the emerging technology trials. Representation on state wide groups for example the flexible learning coordinators group which is actively sharing information and resources, and TAFE Online steering committee.	Workshops conducted that include practical technical skills as well as discussion on learning theories, bringing in external experts where appropriate.

Conclusion

This paper reports on a work in progress where teachers are being engaged not only in learning how to use various mobile devices and social computing tools but also reflecting on and discussing emerging learning theories and pedagogies. Some of the strategies mentioned above provide the foundation for wider uptake beyond the individual project teams.

New technologies have the potential to facilitate innovation in teaching and learning practice. This will only be sustainable and scaleable if a holistic and strategic view is adopted.

References

Dick, B. (1997). *Action learning and action research.* [On line]. Available at http://www.scu.edu.au/schools/gcm/ar/arp/actlearn.html.

Keegan, D. (2005). *The incorporation of mobile learning into mainstream education and training*, Mlearn 2005: 4th World conference on mLearning. Retrieved 8 March 2006 from http://www.mlearn.org.za/CD/articles/keegan1.pdf.

Mejias, U. (2005). *A Nomad's Guide to Learning and Social Software*. Retrieved November 01 2005 from http://ideant.typepad.com/ideant/2005/11/_a_nomads_guide.html

New Media Consortium (2006). *The Horizon Report.* A collaboration between the New Media Consortium and the Educause Learning Initiative. http://www.nmc.org/pdf/2006_Horizon_Report.pdf

Ragus, M. (2006). mLearning: A future of learning. *The Knowledge Tree: an E-journal of Learning and Innovation*, retrieved on 12 May 2006 from http://flexiblelearning.net.au/knowledgetree.

Schon, D. (1983). *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic Books.

Siemens, G. (2005). *Connectivism: A Learning Theory for the Digital* Age. Retrieved on 1 June 2006 from http://elearnspace.org/Articles/connectivism.htm.

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New students, new learning, new environments in higher education: Literacies in the digital age

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Information literacy is developing new meanings and importance in the online age of teaching and learning in higher education. Information literacy, as a highly prized graduate attribute, is related to the development of lifelong learning capacities. Its strong re-emergence in the form of digital literacy in the context of major online developments at Deakin University is considered through four cases. In each case the reader is asked to consider how the teaching staff members have conceived critical discipline-based information and digital literacies, how these conceptions are related to desired learning outcomes, the types of digital and online environments designed to support the development of these literacies, and how each one contributes to the development of lifelong learning capacities. Information and digital literacy is enlivened through being situated in broader understandings of new generations of learners, new forms of learning and new e-supported learning environments. Educational design, evaluation, research and technology implications of these new types of digital and online-based teaching and learning environments are finally examined.

Keywords: information literacy, digital literacy, teaching and learning environments, wholly online units, education design

Introduction

Universities continue to invest large sums of money in corporate technology networks, systems and applications to help enhance the quality, efficiency, accessibility and satisfaction of teaching and learning in higher education. This appears to be a worldwide phenomenon with, for example, most universities in Australia having adopted a commercial learning management system. Increasingly though, such technology investment and the types of e-learning developed, are coming under critical scrutiny. Is money expended on technology making a significant difference to teachers and learners? Are new forms of enduring teaching and learning value likely to be created, as Holt and Segrave (2003), posed? Often, academic teaching staff are brought reluctantly to use technology; at best unsure of the benefits, and with a strong sense of responding to the policy dictates of their University leadership. At worst, perceptions of compliance can lead to either outright rejection or passive resistance to the constructive use of online teaching and learning systems. These responses to attempted change management relating to implementing e-learning need recognition and thoughtful response.

Here we present a useful perspective on designing and teaching with the new digital media and online systems which might help teaching staff in exploring discipline-specific meanings of information and digital literacy for lifelong learning. In doing this, we foreground what is generally agreed to be a well theoretically grounded view of the meaning of quality learning in higher education and its implications for quality teaching. With this as the starting point, we move on to open up the various possible dimensions of new forms of information and digital literacies by examining six significant unit developments in our institution organised into four major cases. These cases are used as points of reflection for questions relating to meanings ascribed to particular curriculum developments, some of which are themselves focussed on the new technologies as key areas of study, educational strategies supportive of the development of contextually-based information and digital literacies, types of technology systems required to enable the development of these literacies, and the relationships of such literacies with the development of lifelong learning capacities.

Implications are drawn on several fronts: for educational design of new forms of teaching/learning environments in higher education and as related to new generations of learners; for new evaluation and research agendas; and for new technological environments supportive of quality learning outcomes. We see information and digital literacy (as key capacity for lifelong learning) as a constructive means of revitalising curriculum development in the context of e-learning possibilities.

Background

We reflect on key issues relating to discipline-specific understandings and practices of information and digital literacy drawing on two areas of research and development work undertaken at Deakin University. The first relates to a strategic teaching and learning grant scheme project completed in 2005 which compiled a suite of cases of contemporary online teaching practice, and reported by Holt, Borland, Farmer, Rice and Mulready (2005). Certain cases covered are grounded in these contemporary developments and are acknowledged as such. The second relates to a research project undertaken by Holt and Challis (2006) on teaching and learning experiences related to a select number of undergraduate units taught wholly online at the University. This research has encompassed in-depth interviews with teachers of the wholly online units and a survey undertaken of the online learning experiences of students in these units. Excerpts of the in-depth interviews have been included to explain the purposes of certain of the units presented. Both initiatives have informed the overall basis of this exploration into varied meanings of developing information and digital literacies in a range of disciplines and as related to a range educational concerns.

Contemporary teaching and learning environments in higher education

> The story seems to be the same around the world. This university-based process of diffusion is significant because it has the highest potential for spreading both the knowledge and the habits of CMC [Computer-Mediated Communication]. …As CMC becomes more pervasive in the university system on an international scale, the graduates that will take over companies and institutions in the early twenty-first century will bring with them the message of the new medium into the mainstream of society (Castells, 2000, p.384).

While Holt and Thompson (1995) identified a staff-perceived imperative in developing and using education technologies as part of the University's strategic move to flexible learning, Castells (2000) reminds us that beyond a sense of compunction still often experienced by many teaching staff required to comply with certain levels of technology usage**,** universities have played a more proactive and creative role in diffusing new technologically-supported social innovations through successive generations of students who in turn carry these capacities into their future employment and citizenship role. The overall environment within which moves to technologically-enhanced teaching and learning has arisen has been characterised by both what seem to be key common strategic priorities relating to teaching, learning and the curriculum, and the major adoption of corporate technologies in support of these priorities across the higher education sector. The strategic teaching and learning priorities cover graduate attributes, internationalisation, experiential learning, and student-centred learning, attributes of excellent teaching and online teaching and leaning. Corporate technologies include learning management systems, digital object management systems, and synchronous communication systems, streaming technologies, gateways, portals and email. Additionally, technologies continue to emerge of potential significance to enhancing e-learning environments like weblogs, wikis and podcasting. In regard to teaching and learning priorities, we believe these are not necessarily straightforward in meaning or practice. Commitments to, for example, student-centred learning are varied in nature and often contested in concept and practice, an observation which is revealed through the cases presented.

Holt and Segrave (2003), in engaging with the challenge of creating and sustaining enduring teaching and learning value through the major investments that have been made in corporate technology infrastructure, systems and applications in recent years, identified six area of great potential. With these potential areas lies the possibility of e-learning to support the development of information literacy in the service of lifelong learning. In fact, it can be argued that e-learning requires new forms of information literacy along with the new forms of curriculum which may make new technologies a key focus of study of and in itself. These matters have become germane in Deakin University's move to extended and wholly online forms of teaching and learning. These new types of teaching/learning environments foreground the nature and importance of information literacy, as underpinning lifelong learning, in the context of curriculum innovation and new digitally and online-centred environments.

Defining information and digital literacy for lifelong learning

On Deakin University's Library website, the definition and skills associated with information literacy are outlined:

> **What is information literacy?**
> The American Library Association defines information literacy as 'an understanding and set of abilities enabling individuals to recognise when information is needed and have the capacity to locate, evaluate, and use effectively the needed information' (CAUL, 2001). Although definitions may vary in detail, there is a common acceptance that information literacy focuses upon developing skills and knowledge in relation to finding, evaluating and working effectively with information.

To be information literate is seen to be an important graduate attribute, related to the need to be information technology literate, and a key capacity related to lifelong learning. Such a well recognised definition, pitched at a general level, can clearly be seen to be applicable to all disciplines and fields of study. It underpins many generic information literacy training initiatives. Deakin University has further elaborated what it has termed 'exemplary characteristics' of each of its identified graduate attributes. For information literacy, it identifies the following characteristics, in addition to those elements of the definition given above: *interpret and solve problems* appropriate for a *beginning professional within the discipline*; *demonstrate knowledge* of typical problems met at *initial levels of practice; read, interpret, synthesise, evaluate* and communicate using the vocabularies, modes, genres, symbols and terms used *within the field of study; use current technologies* appropriate to *entry level work in the field* (Deakin University, 2002, p.6).

Candy, Crebert and O'Leary (1994, p.43) reinforces the importance of information literacy being seen as embedded with disciplinary concerns by highlighting the ability to identify major resources and frame researchable questions in at least one field as part of their definition. Candy et al. (1994) again argue for the centrality of information literacy in the context of developing lifelong learning capacities. In a latter work focussing on the digital revolution and self directed learning, Candy (2004) extends the argument into the realm of digital literacy encompassing or blending technical competence (ICT literacy), information gathering, evaluation and problem solving (information literacy) and the networked, socially constructed knowledge creation and sharing of the net. Candy's work on the nature and importance of digital literacy to contemporary forms of adult learning is matched in *enGauge 21st Century Skills: Literacy in the Digital Age* (2003), an investigation directed, inter alia, at the explication and development of digital-age literacy (and most relevant within this category visual and information literacy) amongst children and adolescents in the schooling system as one of the keys to new age learning.

The views of both resonate with those of Gilster (1997, p.31 & p.33) on digital literacy: 'So literacy in the digital age – digital literacy – is partly about awareness of other people and our expanded ability to contact them to discuss issues and get help. …Developing the habit of critical thinking and using network tools to reinforce it is the most significant of the network's core competencies'. What these views suggest, we believe, is that achieving digital literacy involves moving from a conception of information residing in discrete stable forms of analog media (predominately words and numbers) processed and used individually, to a richer conception of information reverberating through forms of multiple media (increasingly audio-visual), having digitally merged, and become available for continual recycling through collaborative recreations as 'resources in use'. Along with information and technology literacy, Deakin highlights confidence in one's professional development and ability to explore the field, the taking of personal responsibility for one's learning, the capacity to seek out and exploit new learning opportunities, and self-awareness of one's learning approach and style, as all being exemplary characteristics of a *capacity for lifelong learning and an appreciation of its necessity* (Deakin Advantage Guidelines for developing the attributes of a Deakin graduate 2002, p.12).

What comes out of such reviews of information and digital literacy and lifelong learning is the need to examine such desired graduate attributes in the context of specific disciplines and fields of study. Attribute meanings are understood and enacted in contexts. What information and digital literacy means, and how they are enacted and enhanced in the online age, becomes the double-edged challenge. It is one we examine in four cases further in this paper.

Major questions relating to digital literacy development for e-learning

Our starting point is Ramsden's (2003) view of quality learning in higher education and its implications for conceiving quality teaching:

> …learning in educational institutions should be about changing the ways in which learners understand, or experience, or conceptualise the world around them. The 'world around them' includes the concepts and methods that are characteristic of the field of learning in which they are studying. …The aim of teaching is simple: it is to make student learning possible. Teaching always involves attempts to alter students' understanding, so they begin to conceptualise phenomena and ideas in the way scientists, mathematicians, historians, physicians or other experts conceptualise them – in the way, that is to say, that we as academics want them to understand them (pp. 6-7).

'The ways we want them to understand them' is the nub of being literate in the disciplinary sense and captures the thrust of its developing meanings in this paper as disciplines and professional fields shape and become increasingly shaped by new digital and online technologies. The digital and online worlds of teaching and learning create new forms of communicative competence beyond traditional styles of verbal and written communication competence. New styles of communicative competence on the Internet, and its particular domains of activity, are emerging (Crystal, 2001). New forms of visual, auditory, technological, cultural and numerical literacies can be seen, all of which need to be considered within different disciplines and their ways of knowing and knowledge construction. The answers to old questions relating to information acquisition and evaluation in traditional media become more problematic when dealing with data, information and knowledge construction on the Web, or as some might say the 'World Wild Web' given its ever changing nature, complexity and size. Judging the veracity of information and the trustworthiness of knowledge claims on the Net becomes more challenging and adds a new dimension to being information and digitally literate in the online age.

Discipline-specific information and digital literacy in extended and wholly online units at Deakin University

The four cases represent six major unit developments at Deakin University which highlight different facets of developing critical subject embedded forms of information and digital literacy. Each case will briefly outline the relevant unit purposes and information literacy challenges. All of the units examined represent major new curriculum and online developments at the University. Four of the six units mentioned are wholly online developments (see Armatas, Holt & Rice, 2004, for Deakin's definition of wholly online units and further case of teaching wholly online in *Research Methodology in Psychology*). For each, the reader should consider the following questions based on understandings around developing information and digital literacies for quality life-long learning: How are each of the units defining and positioning information and digital literacy as a curriculum challenge?; How are notions of information and digital literacy being related to desired student learning (as in seeing things from new perspectives)? What particular teaching, assessment and media/technology strategies could be used in developing such literacies?; What major technology systems might be required to support the units' learning experiences?; How do the various units contribute to the development of life-long learning capacities? Educational design, evaluation, research and technology implications will be drawn from these cases in the final section of the paper.

Case 1: Developing information literacy in first year in the biological sciences, and health and behavioural sciences

Health Information and Data, offered in first year in semesters 1 and 2, is one of four foundation units which must be taken by all students enrolled in courses offered by the Faculty of Health, Medicine, Nursing and Behavioural Sciences at Deakin (see Story (2005) for further case information). *Science Skills in Context*, offered in semester 1, year 1, is a unit which must be undertaken by all students enrolled in any one of six courses in biological sciences in Deakin's Faculty of Science and Technology (i.e. biology, biomedical sciences, biological and chemical sciences, biotechnology, forensic science and wine science). Both units are being offered wholly online and are seen as key building block subjects for students commencing studies in the health and physical sciences. *Health and Information and Data* is taken by around 1200 students, while *Science Skills in Context* is taken by about 190 students, per semester, respectively. Both attempt to ground forms of information literacy in the context of understanding scientific methods of enquiry, and, with both offered wholly online, there is the added focus of developing forms of digital literacy relevant to dealing with scientific data and information.

Health Information and Data is aimed at developing students' understanding of different ways that health research is conducted and how research results are presented, skills in searching for and retrieving health information and data from online sources, capacities to evaluate critically health research and popular health claims, knowledge of the principles of evidence-based practice when evaluating health research, knowledge of and interpretive skills in basic quantitative analyses in health research, and skills in reading, interpreting and critically reflecting on peer-reviewed health research articles. As the Unit Team Chair commented in relation to the rationale for information literacy being developed by students in this type of wholly online unit subject area: '…the unit covered issues to do with health information and data it seemed, in terms of matching up the modality and the content, it was an obvious marriage that could work to encourage students into this online space with a pretty good rationale that they're going to be using this space in their professional lives down the track. And so it was not an artificial task to make them go online to look up information and interpret that because that's how they do it in the future. Now, they seem to have swallowed that rationale fairly well.'

Closely mirroring such capacities, *Science Skills in Context* aims to provide students with a working knowledge of information systems and their applications to the biological and chemical sciences, understanding of scientific method and experimental design, prerequisite numeric skills for advanced study in the biological and chemical sciences, and skills in how to interpret, critically evaluate, summarize and reference scientific information and data. *Science Skills in Context* has benefited from the preceding development and teaching of *Health Information and Data*. The Unit Team Chair explains the reason why the unit is offered wholly online:

> The transition from secondary to tertiary study requires you to develop a capacity for self-learning. As more information becomes exclusively available in electronic format (e.g. Government reports / Medical Journals / contents of web pages) the ability to learn online in a comprehensive and efficient manner is very important to your future success. This unit aims to introduce you to Deakin University's online learning system DSO in the context of teaching you some fundamentals of scientific thinking, experimental design, data and scientific communication.

These units are designed to address centrally information and digital literacy in the context of their respective fields of study.

Case 2: Developing digital media literacy in political leadership in the arts, and business ethics in management

Political Leadership was a second and third year unit offered in the Politics and Policy Studies Major in Deakin's Faculty of Arts (discontinued because of staff departure in 2006 but used as illustrative of issues involved; see Barton (2005) for further case information). It was taught on two of Deakin's campuses and off-campus to about 120 students in total. The unit was offered in extended online form, with face-to-face lectures and tutorials provided to on-campus enrolled students. The unit aimed to develop in students an understanding of key theoretical elements of political leadership, approaches to understanding why political leadership succeeds and why it fails, an ability to evaluate critically examples of political leadership so as to derive general principles from specific cases, a knowledge of how the personal and the general intersect in political leadership, an ability to apply insights into how the personal and general intersect in current developments, and to analyse what motivates political leaders, how they act as change-agents in society, and why they fail. Holt, Barton and Barton (2004) set out the rich range of digital material (text, audio and video) developed and adopted in applying political theory to a diverse array of political leaders. Broadcast documentary material was used along with a large number of electronic readings and Internet resources. Assignment choice was provided with students being allowed to study political leaders not directly covered in the unit, some of whom would require extensive Internet searching, e.g. 2004 US presidential candidates. Consequently, this unit required students to immerse themselves in both digital and broadcast materials, and Internet resources to understand the contemporary world of political leadership based on political theory.

Business Ethics, a third year, elective unit in the Management Major in Deakin's Faculty of Business and Law commerce degree, also benefited in its development from the model established in Political Leadership (see Wood (2005) for more case information). Audio and video-based case material was organised by topic and media type on CDs, complemented with an online environment for communication, online assessment and other learning resources. It is taught at two of Deakin's campuses and off-campus nationally and internationally to about 80 students in total. The unit aims to give students an awareness of the role that ethical issues play in business life, an ability to articulate and discuss the principles of business ethics, a capacity to demonstrate their understanding of business ethics through the development of skills in analysis, problem solving and writing, and the skills to argue for their perceptions of each concept in a manner that highlights an attempt to reach a deeper, more balanced understanding of the issues concerned.

The unit adopts a case approach to illuminate ethical theorising and decision making approaches. So, for example, in dealing with the topic on Rules, roles and responsibilities, a case study, Joe Camel is used, along with a supporting digitised television documentary, Tobacco Wars, an audio interview with a representative from the Australian Institute of Management, and links to relevant Internet sites. Bates' (1995, p.75) observation that, "'Open-ended' documentary style programmes can be a valuable teaching resource, if used to encourage students to interpret, analyse and problem-solve" is equally applicable to such material used in *Business Ethics* and *Political Leadership*. In order to support students gaining maximum value from all of the digital media in *Business Ethics*, the Unit Team Chair has devised 'audio and video guides to study' to help structure students' engagement as they work through these resources. The desirability of this type of learning process support material is reinforced in regard to early research undertaken at the UK Open University on students' use of broadcast media (see Bates and Gallagher, 1987). This research found that students can often miss the major educational messages incorporated in audio-visual resources in the absence of appropriate guidance on the best ways of engaging with and learning from these media. The research related to documentaries on broadcast television which, in some cases, were reproduced on video and audio cassette. The cassette has now been replaced by reproductions on CD, DVD and online allowing for a tighter integration of text, still image and audio-visual learning resources.

Political Leadership and *Business Ethics* therefore represent significant digital developments requiring forms of multimedia digital literacy in bringing together political and ethical theorising on the one hand, with case study documentaries and expert perspectives on the other. Both units demand students to engage more widely and critically with popular broadcast media and Internet resources in understanding the contemporary and compelling nature of their subject matter.

Case 3: Dealing with sensitive knowledge and digital materials in sociology in the arts

Sex, Crime and Justice in Electronic Society, a third year elective unit in Deakin's Bachelor of Arts program, is a wholly online unit which was offered for the first time in semester 2, 2005 (see Zajdow (2005) for further case information). It is taken by students enrolled in sociology, criminology and women's studies majors in the Arts' degree as their required wholly online unit. The Unit Team Chair describes the learning outcomes of the unit as follows:

> One, we wanted students to step back and consider the social world, even the electronic world in a less technologically determinist fashion and that was the hardest thing to get across. …Two, the notion that a whole heap of crimes and criminal activity that exists on the net now is somehow new when clearly it is not new. …I really wanted them to consider was just because it's on the net doesn't actually make it real, truthful or in any way useful

> and that was very hard to get across …You know, just because it's there, doesn't mean that it's useful so they have to start thinking about it somewhat more reflectively and critically.

Importantly in this unit, while there is discussion about social changes around sexual identity and the internet, as well as sex crimes on the net, students are not required to, nor are they able to, access internet pornography sites. University policy clearly states that users of university servers are prohibited from accessing pornographic or other such sites and the unit team thoroughly endorsed this policy. In the unit, continuous assessment tasks involve online data retrieval and analysis activities and the undertaking of a major research project and report. This unit deals with a number of sensitive issues from a multi-disciplinary perspective, challenging students to apply social science theorising in order to engage critically with popular broadcast media's treatment of such issues, and also immersing students in online communicative environments to experience the notion of 'electronic society, or community in action' as related to their learning of the subject.

Case 4: Improving analytical skills for developing media and communication literacy

Advertising: Designing Desires, is a third year elective unit in the Media and Communication Major in Deakin's Faculty of Arts. The unit was offered for the first time in semester 2, 2005 (see Hughes (2005) for further case information). Its rationale as a wholly online unit was outlined by the Unit Team Chair: 'If you're going to do a unit which investigates and explores an aspect of, shall we say, popular culture or the contemporary public sphere…it seemed to me only right and proper that we should use an electronic environment because much of advertising – like much of contemporary popular culture – exists in an electronic environment such as online would provide'. Students use a set of analytical tools and themes to engage with provided learning resources, all of which are in digital form made available both on CD and online. Much of the learning resources are advertisements either originally created in digital form or converted to digital for the purposes of the unit. The unit highlights the importance of forms of digital visual literacy grounded in disciplinary tools and themes. Students are formally assessed on their ability to integrate theories and practices of advertising; and to apply those theories and practices in other sectors of communication.

Reflecting on the first offering of the unit, the Chair makes a number of observations on the nature of the unit's assessment requirement, outcomes and areas for enhancement: 'I wanted it to be enjoyable in the sense of stimulating and exciting and that comes through in the assessment, where I ask students firstly to analyse adverts but also to use their analysis and to use the resources of the unit to then change one or more aspects of an advert so that it means a different thing. …What's not been explicit is, in a sense, what aspects of the unit have led them to take the decisions they took. Now that is a weakness of the assessment. I've not asked them to explain what they've done and so that's fair enough. Some can clearly do that and some in fact have volunteered the information but …I've already started redrafting it to make them be more explicit about what they're doing and why – in the same way that I've tried to be explicit in what I'm doing and why as I provide them with analyses and exemplars that are also part of the assessment'. Students, as active producers of their own digital work, will be required to develop *forms* of digital literacy ranging from IT literacy in being able to capture, create, upload and share their work to critical visual literacy in engaging with various advertising forms to disciplinary literacy in working with communication theories and themes.

Key educational design, evaluation, research and technology considerations

Each of these cases sheds new light on the meaning of information and digital literacies in our contemporary culture imbued with generative media. The cases represent local efforts to work with discipline-contextualised, digital literacy with all its attendant multimedia, communicative and collaborative know-how developed in particular settings. One unit chair expresses the struggle that this entails:

> …what would it feel like to do what I've called a lateral unit rather than a linear one; and…how much value is there in the current cant about learning being student led rather than being teacher led? So I thought, how can I create a unit which, while offering the

> things that I think, as an experienced academic, students need to know in this particular area, offers those things in such a way, that a) there is no predetermined path through them and b) enables students to acquire that knowledge, information and expertise in ways that make more sense to them. …So in other words, I wanted to say to them, 'Here's this stuff, go and do it', but I also wanted to say, 'This is how you do it' and those seemed to me to be irreconcilable (Unit Team Chair: *Advertising: Designing Desires*).

This is an age at Deakin University characterised by the move to extended and wholly online units. At its heart, it has been curriculum innovation – new ways of conceiving what, why and how students should learn – and carrying with it new views on critical discipline-specific digital *literacies*, which has provided some of the most potent ways of mobilising and using digital and online technologies in our own institution. This is a problematic curriculum design challenge as can be seen from the Unit Chair quoted above because as Candy (2004, p.39) observes too, 'Yet, while there is a burgeoning literature about the use of digital technologies in education…much of this turns out to be fundamentally about enduring educational problems and issues, rather than about anything dramatically new and transformational. …many of those experimenting with ICT in classrooms are doing precisely that – simply experimenting with ICT – and leaving fundamentally unchanged important aspects such as the structure of the curriculum, the dominant modes and purposes of assessment, and most importantly the powerful role of the teacher, trainer or facilitator and the relative powerless and dependent role of the student, trainee or learner.'

We emphasise 'literacies' because these new e-learning environments require the development of layers of different types of literacy from technical to visual to the critical and methodological, based on different disciplines' modes of enquiry. The cases highlight the importance of mastering these literacies as key educational goals of the respective subjects. For each, the aspiration is to develop in students critical faculties in better engaging with, understanding and acting constructively within their worlds. Educational design strategies in support of new educational aspirations need to focus on both student circumstance, and the location and development of critical information and digital literacy capacities at the unit and course levels. In regard to the former, institutions like Deakin must service the needs of a broad range of student cohorts on-campus, cross-campus and off-campus nationally and internationally in ways consistent with its core commitments to rural and regional engagement, and equity and access for individuals and groups who might not otherwise enjoy the benefits that flow from participation in higher education (*Taking Deakin University Forward* 2005). For example, how does one deal with the following two student profiles at opposite ends of the technology access and technical competence spectrum: Judy the 17 year old school leaver, entering University with a broadband enabled computer in her bedroom and Personal Communication Device in her purse, and who works 10-15 hours per week mainly on Friday nights and weekends and intends to be a "Full-time Uni student" (described by Luckow, 2003 as the 'Google generation'); and Bob the mature age student from a small community in outback Queensland who works full time has a poor phone connection and no computer at home, minimal computer skills, and whose nearest reliable internet connection is 200 km away in "local" library that is open from 10:00-4:00 Monday-Friday.

A fair, inclusive approach to developing information and digital literacy in the online age for these student profiles is imperative. In regard to the latter, there is a need to recognise when the unit's subject matter is about the new technologies and hence treat information and digital literacy as a pivotal curriculum design issue as in the cases of *Sex, Crime and Justice in Electronic Society* and *Advertising: Designing Desires.* It is important to locate these types of units and their special contributions to the development of information and digital literacy in the context of their majors and courses, or students' overall sense of their course learning experience. Appropriate learning resources need to be developed and teachers need to model appropriate engagement with such resources and online communication processes reflecting accepted modes of enquiry of the discipline. These modes of enquiry should make explicit the criteria by which sound judgements can be made, and exemplify the appropriate use of online search tools and search strategies (Candy, 2004). Formal assessment tasks eliciting desired forms of learning from digital and online environments need to be designed.

Comprehensive and well integrated technology systems are required to support the aspirations of some of these cases. At Deakin, while our learning management system has been integrated with the University's administrative systems, more work is being done to integrate these with a Digital Object Management

System, a synchronous communication tool, a lecture audio and video streaming system, and recording live off air media systems. Staff and students need multimedia content creation tools at their 'fingertips', the competence to use them effectively and upload, download and manipulate various types of digital material cost-effectively for teaching and learning purposes. The advent of Learning Management Systems and Digital Media Object Repositories for information 'management' and content 'delivery', has been misconstrued as providing instant, ready-made *education*. On the face of it, there is a sense that students are managed as content is managed and the challenge of facilitating active, productive learning using digital technologies is somehow ignored. McLuhan and Fiore (1967) stated that 'The environment we create becomes our medium, for defining our role in it!', and that students want 'roles' and 'total involvement'.

More recently Diana Laurillard (2005) advocated 'productive action-learning' by students and a national Australian Universities Teaching Committee (AUTC) funded project conducted over several years researched and advocated the use of Information and Communication Technologies for specified 'learning designs' that create high quality student e-learning experiences involving activities and interactions (see Agostinho, Oliver, Harper, Hedberg & Wills, 2002). *'Learning-experience design'* for productive pedagogies online is a relatively new field with as yet few exemplary practices. Active and productive learning online by students, with the corresponding presentation of the artefacts of their new knowledge and capabilities, should be an emerging focus of technology development. The goal is for students to use digital tools, processes and resources in a manner that cannot be otherwise achieved in a congruent and authentic manner in a physical learning environment. Students should use digital tools and processes to source, analyse, manipulate, synthesise, create and present works in *digital gallery*-type environments which would in turn add great value to current corporate technology systems. These environments will increasingly adopt the newer social software approaches and tools, such as Blogs, Wikis and podcasts, to enhance the learning experience through live teaching/learning, feeds, and open and collaborative knowledge creation and sharing activities. The move to the read-and-write Web, so-called Web 2.0, opens up new dimensions of digital literacy for learners and teachers as active consumers, and critical readers and editors of information (see Richardson, 2006, pp.126-27).

Finally, these curricular, digital and online developments lead us to re-examine students' conceptions of, and approaches to learning, and their demonstrated learning outcomes in these types of digital and online teaching/learning environments. It could be argued that the same re-examination is necessary in relation to reflections on teachers' conceptions and approaches to effective forms of teaching in such environments. Moreover, renewed research on the development of critical digital and information literacies in key disciplines, professional fields and technology domains would seem essential, along with understandings of how such literacies could be more systematically developed through key levels of study. The relationship of 'information literacy' to other graduate attributes in developing the student as person/professional requires ongoing attention.

Conclusion

We have argued that new understandings of information and digital literacies can be an integral part of curriculum innovation in higher education and provide a constructive entry point into examining the ways in which e-learning can add enduring teaching and learning value. This view is consistent with conceptions of quality learning and teaching in higher education and their consideration in the context of the newer digital and online-based environments. The cases illustrate how a number of important questions relating to information and digital literacies, lifelong learning, and digital and online technologies, are being addressed in the context of curriculum innovation. However, we suggest that while the established and stable communication media technologies are an essential foundation for the innovative curriculum aspirations of educators, the new social-software technologies, for example, challenge both students and teachers to interact constructively in new ways within contemporary culture. New roles for learner and teacher challenge the polarized concepts of teacher centredness and student centredness. In higher education, parties communicating in any educative endeavour need new skills in the contemporary literacies. The cases report how one higher education institution is attempting to engage proactively and creatively with e-learning possibilities, and hence demonstrate leadership in educational design and development in relation to the literacies required in this digital age.

References

Agostinho, S., Oliver, R., Harper, B., Hedberg, J. & Wills, S. (2002). A tool to evaluate the potential for an ICT-based learning design to foster "high-quality learning. In A. Williamson, C. Gunn, A. Young & T. Clear (Eds), *Winds of change in the sea of learning.* Proceedings of the 19th ascilite conference (pp.29–38). UNITEC, Auckland, New Zealand. Learning Designs website: http://www.learningdesigns.uow.edu.au/ [viewed 21 July 2006].

Armatas, C, Holt, D.M. & Rice, M. (2004), 'From online-enhanced to wholly online: Reflections on e-learning developments in psychology in higher education' in R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds). *Beyond the Comfort zone*. Proceedings of the 21st Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ascilite), vol.1 , Perth, Australia, 78–87.

Barton, G. (2005). *Digital media in politics and Asian studies*: http://www.deakin.edu.au/teachlearn/cases/files/participants/barton.htm [viewed 13 April 2006].

Bates, A. W. & Gallagher, M. (1987). 'Improving the educational of television case-studies and documentaries' in Boyd-Barrett, O. and Braham, P. (Eds.) *Media, Knowledge and Power*. London: Croom Helm.

Bates, A.W. (1995). *Technology, Open Learning and Distance Education*, London: Routledge.

Candy, P., Crebert, G., O'Leary, J. (1994). *Developing Lifelong Learners through Undergraduate Education*. DEET: AGPS.

Candy, P. (2004). *Linking Thinking Self-directed learning in the digital age*, DEST Research Fellowship Scheme.

Castells, M. (2000). *The Rise of the Network Society,* 2nd ed., Oxford: Blackwell.

Crystal, D. (2001). *Language and the Internet*, Cambridge: University Press.

CAUL (2001) *Council of Australian University Librarians. Information Literacy Standards*. Canberra: (see http://www.deakin.edu.au/library/findout/information_literacy.php).

Deakin University (2002) *Deakin Advantage Guidelines for developing the attributes of a Deakin graduate*, Deakin University.

EnGAUGE 21ST Century Skills: Literacy in the Digital Age (2003), Illinois: North Central Regional Educational Laboratory and the Metiri Group.

Gilster, P. (1997). *Digital Literacy*. New York: John Wiley.

Holt, D.M. and Thompson, D. J. (1995), 'Responding to the technological imperative: The experience of one open and distance education institution', *Distance Education: An International Journal*, 16 (1), 43–64.

Holt, D.M. and Segrave, S. (2003), 'Creating and sustaining quality e-learning environments of enduring value for teachers and learners' in G. Crisp, D. Thiele, I. Scholten, S.Barker, J. Baron (Eds). *Interact: Integrate:Impact*, 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ascilite), vol.1, Adelaide, Australia, 226–35.

Holt, D.M., Barton, G. & Barton, S.M. (2004), 'From the comforts of print to the possibilities of digital media: Leading the way in teaching political leadership in a Faculty of Arts' in R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds). *Beyond the Comfort zone*. Proceedings of the 21st Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE), vol. 1, Perth, Australia, 403–12.

Holt, D.M., Borland, R., Farmer, J., Rice, M. & Mulready, P. (2005), 'Casing out teaching and learning online: enhancing fidelity into the mainstream', *Balance, Fidelity, Mobility: Maintaining the Momentum?* The 22nd Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ascilite), Brisbane, 261–70.

Holt, D.M. & Challis, D. (2006). 'From policy to practice: one university's experience of implementing strategic change through wholly online teaching and learning', *Australian Journal of Educational Technology* (submitted for publication).

Hughes, P. (2005). *Developing 'MediaWise' in a wholly online media and communication unit*: http://www.deakin.edu.au/teachlearn/cases/files/participants/hughes.htm [viewed 13 April 2006].

Laurillard, D. (2005). *E-Learning in Higher Education*, draft chapter in Changing Higher Education, Paul Ashwin (Ed.), Routledge, London.

Luckow, D. (2003). Help for Google generation *Simon Fraser University News* Nov 13, 2003, vol. 28, no. 6 http://www.sfu.ca/mediapr/sfu_news/archives_2003/sfunews11130306.htm [viewed 20 July 2006]

McLuhan, M. & Fiore, Q. (1967). *The medium is the massage*. Harmondsworth, Middlesex. England: Penguin Books.

Ramsden, P. (2003). *Learning to Teach in Higher Education.* London: RoutledgeFalmer.
Richardson, W. (2006). *Blogs, Wikis, Podcasts and Other Powerful Web Tools for Classrooms.* California: Corwin Press.
Story, I. (2005). *Health information and data wholly online*: http://www.deakin.edu.au/teachlearn/cases/files/participants/story.htm [viewed 13 April 2006].
Taking Deakin University Forward 2005, Deakin University.
Wood, G. (2005). *Digital cases and expert views on business ethics*: http://www.deakin.edu.au/teachlearn/cases/files/participants/wood.htm [viewed 13 April 2006].
Zajdow, G. (2005). *Studying sex, crime and social justice wholly online*: http://www.deakin.edu.au/teachlearn/cases/files/participants/zajdow.htm [viewed 13 April 2006].

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Designing for disruption: Remodelling a blended course in technology in (language) teacher education

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This study employs a case study model to documenting the evolution over three semesters of a Masters course in technology and language learning for in-service teachers using a social constructivist pedagogical approach (Felix, 2002) within an ecological framework, from completely face-to-face (f2f) to predominantly online. The focus is on teachers' acceptance of change in the form of integration of technology into firstly their learning and secondly their teaching, as well as their adaptability to self-managing their learning. The design of the modified course took an experiential modelling approach in which all of the tools and processes that were taught in the course were modelled and experienced by students (teachers) during the semester. These tools include reflective and social computing tools such as chat, blogs, wikis and e-portfolios, as well as lesson and task templating software such as Swarthmore Makers®, Hot Potatoes®, and WebQuests®, and webpage creation software such as Dreamweaver®. Based on grounded research methods, techniques such as surveys, problem-based focus groups and short answer responses were used to ascertain the values of the changes. The information collected from these instruments is presented and compared to the reflective pieces produced by students in their blogs, and the projects they created.

Keywords: teacher education, social technologies, social constructivism, ecological pedagogy, chaos/complexity theory, disruptive technologies, learner-shaped course design

Introduction and background

The 1-semester course, Technology and Language Learning, is offered every semester as part of the Masters in Education (Teaching English as a Second Language [TESOL]/Languages Other Than English [LOTE]) program. It aims to provide practising teachers, at elementary and secondary schools as well as post-secondary and private language schools, with an understanding of the technology available to them for the enhancement of their teaching and incorporation into the curriculum. This understanding is firmly based in a theoretical and historical framework appropriate to current language pedagogical approaches which are predominantly social constructivist in nature and focus on learner-centred curricula, co-operative and collaborative processes, the development of higher thinking skills, and real-life tasks. Since most of the students in this course are currently teaching, classes have always been scheduled outside of work hours in the evening. Consequently, students come to class tired and, being mature-aged, often have home and family commitments which further impinge on their ability to attend or concentrate in class. In addition, increasing numbers of students in the Masters program are from overseas and do not wish to take evening classes, if at all possible, as they are not working and wish to complete their program of study in the shortest time. Others would even prefer to have the opportunity to continue at least part of their studies from their home countries or from countries where they have found work. The technology course is further constrained because of the need to be scheduled in computer laboratories, most of which are fully booked during the day for more traditionally technology-intensive courses such as IT or media studies.

Although students in the Masters program pay full fees, changes in the distribution of this money has meant that these fees no longer come back to the School teaching the program. There are, therefore, financial constraints on how courses within this program are taught, in addition to considerations of pedagogy and administration. In an effort to address the needs of this diverse body of students and provide more flexibility, teachers in the program have looked at a variety of options, one of which was to change the mode of some of the courses from face-to-face to fully or partially online, with some intensive face-to-face seminars. This change is also seen as a means of embracing some of the newer approaches to learning and teaching made possible through the use of emerging social networking computing tools. This was certainly seen as a more pedagogically sound alternative than lapsing into the pattern seen elsewhere of transferring existing transmission or transaction teaching practices into a similar form, delivered electronically (Zemsky & Massey, 2004; Anderson & Elloumni, 2004; Anderson, 2005; Hughes, 2005). The technology course was the most obvious choice as a trial and starting point for this process. If this change in mode is well-received by the students, this course will then be used as a model for other courses in the program to follow. It has therefore been necessary to document carefully the design, resourcing, and implementation tools and process, as well as to seek students' feedback on the change in mode and to what extent they feel their goals and expectations have been met.

As literature in the area of technology in teacher education shows (Reeves, 1996; Hughes, 2005) the process of becoming a user of integrated technology in the classroom necessarily involves the experience of successful uses of different tools available. In order to then become familiar enough with the uses of different forms of technology to see the wider range of affordances available (Gibson, 1986; van Lier, 2000), teachers need experience with consistent modelling of effective uses and practice in their use (Bird & Rosaen, 2005; Brook & Oliver, 2005; Hughes, 2005).

Contemporary literature on cognitive social constructivism and teacher change in the use of technology emphasises the importance of self reflection on one's beliefs and values as a precursor to the emergence of consciousness of questions or conflict which can then facilitate change in attitudes and beliefs (Richardson & Placier, 2001; King, 2002; Hughes, 2005). As Hughes found, change in teachers' attitudes towards technology in their teaching and subsequent effective use of it, are entwined with teacher learning, comprising: subject matter knowledge, pedagogical knowledge, and pedagogical content knowledge. In other words, teachers will only embrace change and innovation when they can see positive benefits in terms of direct relevance to their content area, usefulness from a practical task perspective, and increased effectiveness for their day to day classroom teaching.

For the field of language teacher education, upheavals in mainstream pedagogy from teacher-centred or transmission approaches to more learner-centred, negotiated modes have been paralleled in the language content area. The emergence and maturation of the Communicative Language Teaching approach over the last two decades, with its emphasis on using language for communication and negotiation of meaning rather than merely teaching about language has meant that language teachers have been able to recognise and incorporate many aspects of social constructivism into their pedagogical approaches without too much change. However, the addition of technology into the communication process does represent a major change for many language teachers who are used to more direct face-to-face modes of language learning, teaching and use.

Compounding the changes in attitudes and pedagogical approach with the incorporation of technology in the program under discussion here, is the additional feature of intercultural applicability. Since over 80% of students in this Masters program were overseas trained and practising teachers from 8–12 different countries, it was also necessary to be sensitive to the differences in background, prior pedagogical experience and technological constraints of these students. Though awareness is increasing about the possibility of the need to modify or re-think social constructivist approaches to teaching and learning when teaching interculturally, little investigation in this area has been implemented to date (McLoughlin & Oliver, 2000; McLoughlin, 2001a,b; Thorne, 2003; Hannon & D'Netto, 2005; Scholfield, 2005). Therefore an investigation of attitudes and perceived usefulness of the range of tools and the pedagogical experiences of learners from different cultural backgrounds and returning to varied teaching contexts was critical to a comprehensive evaluation of the effectiveness of this transitional redesign (Hannon & D'Netto, 2005). These results, however, will be discussed elsewhere. Also essential to the redesign was the need to provide an approach to the course experience that was flexible enough to accommodate and support these students. Much discussion is emerging in the literature about the disruptive influences of new technologies on our lives (Bower & Christensen, 1995; Christensen, 1997; Dvorak, 2004) and this is especially true of language teachers who have not traditionally been early adopters of technology. To help these in-service language teachers realize the potential affordances (Gibson, 1986; van Lier, 2000) of social networking software and tools of communications technology, and to provide the flexibility in pedagogical approach necessary to cater for the range of cultures and teaching contexts represented in the class, it was decided to take an experiential modelling approach in the design of learning experiences in this course. This included the use of blogs on an ongoing basis throughout the course, as well as the incorporation of e-portfolios, to provide learners with the means of tracking their emerging understandings and competencies.

The study

Students in the Technology and Language Learning course are typically practising teachers, both local and overseas, who are upgrading their qualifications for promotion purposes, to update their skills and knowledge in the field, to change positions, or to seek employment overseas. They are generally highly motivated to achieve and complete, and demanding of quality teaching and learning. Because of the on-going rapid developments in technology and the lag in adoption and understanding of these in the school sector, the teaching and content selection of this course had been problematic for some time. The decision was taken, therefore, to conduct a longitudinal case study research project, while collecting information about student expectations, demands, outcomes, and perceptions about their acquisition of what they saw as necessary skills in the area of technology and language learning. The first semester therefore represented a pilot study in that student data, observations and information collected in this semester formed the basis for the formulation of the modifications and focus group questions for subsequent semesters as well as helping to identify areas of possible change in the course design. Teaching experiences during the first semester, together with the data collected during both the first and second semesters were then used to re-formulate the structure and focus of the course in the design for the third semester.

An experiential modelling approach was taken in the design and teaching of this course, to immerse students in the use of the technologies, while at the same time experiencing the practical application of the theory in their own learning. This experience included self-directed selection and construction of content, and, to some extent, the assessment tasks. The development of self-reflection skills and peer feedback and support strategies paralleled their acquisition of technical and metacognitive skills of planning, monitoring and self-organisation (Oxford, 1990). The parallel development of these skills seemed to emerge organically from a self- and mutually-supportive collection of individuals to form a cohesive inter-reliant collaborative community of learner-practitioners. Because this re-design was a local rather than university-wide initiative, little technical support was available to the teacher-students, apart from the central helpdesk and several professional development workshops (Barber & Wilkinson, 2005; Reiner, 2005). The predominant focus behind this design effort was therefore the need to devote "a minimum of time to teaching uses of software, by employing the affordances of selected technology as tools for professional learning tasks that are authentic for school teaching" (Bird & Rosaen, 2005: 213). The term "affordances" is used here to refer to the characteristics and potential uses that individual learners felt that different software tools had to offer them. In other words, different learners saw different potential applications and implications in the range of tools to which they were exposed. Through sharing their insights, experiences and skills with each other, all learners managed to produce artefacts and achieve new learning that (as previous semesters had shown) they could not aspire to achieving individually, or through the traditional mode of course offering. The work of Bird and Rosaen (2005) with pre-service teachers and that of Hughes (2005) with in-service professional development provided useful precedents for the current study with in-service teachers, as well as the insights of Blythe (2001) into the practicalities of learner-centred design.

Features of the course in the 3 semesters

While all three semesters differed to a greater lesser extent (as illustrated in Table 1 below), the stated aims of this subject included exploring the creative teaching potential of technology such as Computer Enhanced Language Learning (CELL), interactive multimedia, and tools for social computing as well as exploring access to and pedagogical uses of electronic communication such as e-mail, list servers, chat and discussion forums. Through this exploration, the subject explicitly focused on the possible roles technology can play in changing models of language teaching and learning. Content included the following theoretical and practical components:

1 Research and theory relating to the effectiveness of technology in language learning
2 The computer as tutor or tool or manager of learning
3 The integration of technology into a second language program

4 Issues of classroom uses and self-access uses of technology, including instructional design, presentation, learner interaction, and feedback
5 Techniques for evaluating the quality and usefulness of CELL software and other technology-based language learning materials
6 Developing learner autonomy through active use of technology in language learning – exploiting the media in optimal ways.

Table 1: Course format and differences over three semesters

Sem.	Physical	Pedagogical	Assessment
1	• weekly 3-hour lecture/tutorials • 23 students at beginning, 18 at end with only 6 attending classes	• fixed timetable • teacher-set modules & order of presentation • fixed deadline dates and order of assessment items	• online discussion responses by module (specified number) • software evaluation form & essay discussion • major module development project & rationale essay
2	• 3 full-day workshops • f2f or electronic student drop-in sessions • 9 students at beginning, 7 at the end (fees increased 37% between Sems 1 & 2)	• free-form • learner-shaped • responsive • learner individually-determined order and deadlines for assessment tasks	• communication & collaboration through blogs, wiki, discussion forum, chat, email, SMS & e-portfolio • WebQuest including teaching notes on Teacher page & Evaluation Rubric • module of online language learning activities based on online templating tools embedded in Dreamweaver
3	• 3 full-day workshops • f2f or electronic student drop-in sessions • 12 students at beginning	• free-form • learner-shaped • responsive • fixed deadline dates and order of assessment items	As above

The three phases

As mentioned above, this study is longitudinal in nature and comprises three phases to date. Because of the experiential nature of the study, the outline of how this was conducted and data collection is necessarily embedded in the process of the course unfolding. Aims of the study include:

- documenting and analysing teacher-student reactions and responses to changes in course design, including:
  - changes to teaching approaches from a transmission or transaction approach,
  - changes in mode of teacher-student interaction from face-to-face to a blended model incorporating electronically-mediated communication and collaborative construction of artefacts, and
  - changes in the learning experience from a receptive model to one which relies on active student participation, collaborative negotiation with the teacher, other students and the resource materials.

This study used a case study approach based on grounded research methodology (Knapp & Glenn, 1996; Reeves, 1996; Kanuka & Anderson, 1999; Willig, 2001; Passi & Mishra, 2004). Following these models, at the beginning of each semester, students responded to an on-line survey which elicited their biographical details, their previous or existing computing experience, confidence, competence and skill level (self-assessed), and information about their preferred language learning styles (based on Willing's 1989 inventory) and strategies (based on Oxford's 1990 inventory). In the first or pilot semester, this survey, without the biographical section, was also administered at the end of semester to discover any changes in student learning styles and their perceptions of learning that had taken place. Specific data collection techniques for each phase are detailed below.

Table 2: Phases of the study

1^{st} semester (Phase 1)	2^{nd} semester (Phase 2)	3^{rd} semester (Phase 3)
Pilot study Pre-existing teaching model with LMS: • worksheets • Powerpoint slides • notices from lecturer to students • calendar • discussion forum • reflective Notepad • online readings database • tutorials for online-sourced tools Data from: Observational & survey data collected	• beginning of formal study • 1^{st} major re-design • data from: • surveys • focus group discussions • short responses to evaluative Qs • compared to reflective artefacts: • blogs & wiki pages • discussion forum postings • compared to projects produced: • WebQuests • online activity modules	[still in process] • refinement phase • minor modifications to course design from Phase 2 student comments [results not yet analysed or included here]

Semester 1: Pilot study

In the first semester of observation and data collection, as detailed in Table 1, the course was conducted as it had been over previous semesters by different teachers, with a focus on technology as content. Students were surveyed at the beginning of this semester for their competence and confidence in the use of a range of common computer-related skills and tools, their preferred learning styles and strategies and their expectations of the course. Towards the end of the course, and before submission of the final individual project, students were anonymously surveyed by the program convenor for their level of satisfaction with the course and suggestions for improvement. Three main areas of improvement were evident in these responses:

1 more practical use of the technology
["We were in a computer room but the hardly used the computers at all"
"Students should have had more practical work"]
2 greater learner focus in the course design and content
["more attention to students' feelings and needs"]
3 less theoretical focus
["the large amount of theory in this subject was disappointing"]

These responses indicated a clear need for more hands-on tutorials and less theoretical work. That is, their expectation was for a better understanding of the tools available and more experience in using them, with much less focus on the pedagogical and theoretical aspects of software selection, evaluation and integration into the curriculum. However, these responses revealed a conflict between student expectations and those of the university and future employers with respect to the content and quality of a Masters program in Education.

From a faculty perspective, this feedback highlighted the need to clarify better the outcomes of the course to emphasise the essential inter-relations between theoretical and practical aspects of the uses of technology and the need to provide better-focused hands-on workshop materials. Another revelation emerging from the feedback was the importance of changing the course assessment radically, to better reflect what the learners need, and need to know, from such a course at this level, and to use the course experience to model the changes in pedagogy emerging from the increasing use and availability of social networking software. Following the example of Bird and Rosaen (2005), the decision was therefore made to change the mode of offering of this course and to use the available technology as both medium and content simultaneously through an experiential modelling approach. The design approach has also drawn on the experiences of Brook and Oliver (2005), Brown and Voltz (2005), Steketee (2006) for advice on community creation and maintenance and the integration of technologies.

Semester 2: The major study

Experimenting with a learner-shaped approach to course design in the second semester (Hoven & Sussex, in press), no deadlines were set for assessment items, which consisted of reflective and collaboratively constructed pieces over the semester using blogs, a class wiki and an e-Portfolio as well as two creative pieces: a WebQuest and an online language learning module of activities. The creation of a WebQuest (http://webquest.sdsu.edu/) designed for learning an aspect of language included student reflection on the relative uses and usefulness of such a task for their teaching contexts and teaching notes about this. Students learnt about the purposes and construction of a WebQuest through the experience of completing a WebQuest on WebQuest creation constructed by the lecturer. The major piece of assessment was an online language teaching module using online templating tools such as Hot Potatoes (http://hotpot.uvic.ca/) and Swarthmore Makers (http://lang.swarthmore.edu/makers/), embedded in webpages created using *Dreamweaver* or *FrontPage*. To support and provide scaffolding for the experience, reflection and critique of the technologies, students used their blogs of their reading, reflection and experiences and the e-Portfolio. As part of the university's mission to tailor course experience to employment, an e-portfolio facility, including a content templating feature had already been developed and made available to students through the LMS. Unfortunately, since students made little use of this facility, information from this source is not discussed here.

As illustrated in Table 2, the changes to assessment for the course described above, together with a number of more course-focussed tool tutorials also made possible the change from weekly face-to-face lecture blocks to a more flexible teaching mode, using social networking software to establish students' 'social presence' (Garrison et al., 2000) as part of the course system. A wiki produced as part of a language course at the university was used as illustration of its uses before students were directed to Wikipedia and their own class wiki site (http://collaborate.ci.qut.edu.au/techllwiki/index.php/Main_Page). Reflective blog accounts were then established on the Web at *Blogger*, accompanied by a discussion of the values and uses of blogs and some examples of these. The instruction on blog and wiki creation and maintenance was provided in an online synchronous session at the beginning of the first workshop using *Elluminate Live!* by an instructional designer at the Fairbanks campus of University of Alaska. The purpose of this session was to enable students to experience first-hand the process of participating in practical instruction synchronously at a distance. This *Elluminate* session was recorded and made available to students to access and replay at any time throughout the semester. In this way, the scene was set for them to participate in some drop-in sessions through the medium of chat in the LMS later in the semester. On completion of this workshop, students then posted their comments and reactions to the workshop on their newly-created blogs and began to shape the wiki to their own purposes through their contributions there. From the blog and wiki postings in the week following this workshop, this experience engendered the necessary trust and understanding of other students to trigger the formation of a collaborative class community which carried through and progressively strengthened during the rest of semester. Evidence of this is derived from the fact that, with no specification as to minimum numbers of blog, discussion or wiki postings, students spontaneously established and maintained constant and persistent online presence using these tools.

In the second last week of semester, the third and final workshop was held. In this session, students participated in problem-based focus group discussions which were videoed and transcribed. The transcriptions were searched for key words relating to their reactions to course participation, and their recommendations for future students as well as changes and refinements to the design. These focus groups were built around responses to a series of scenarios deriving from characteristics and reactions of current and previous students and features of the course design. Students were asked to analyse what problems were exhibited in each scenario and to give certain advice to these people. In addition, students volunteered their own summary notes to the lecturer for the purpose of the study.

A summary of comments elicited by the pre-course questionnaire is outlined in Table 3 below, followed by the main issues emerging from the focus group discussions in the second last week:

Table 3: Summary of Phase 2 pre-course questionnaire student responses

"How do you feel about using computers to learn language?"	"Overall how do you see the role of computers for language learning?"	Learning style data
• Quite interesting: audio & visual possibilities • No experience, excellent way for learners to control their own learning – don't know much • Quite comfortable • Excited – but how to avoid the glitches?? • Good for individual preparation prior to immersion • Good for private study but prefer f2f • Requires autonomy which doesn't suit my learning style • Don't feel comfortable using blogs, discussion forums etc – too permanent	• mainly as instructional CALL • not sure about using CMC with students – never know who they might be talking to • uncertain about being "out there" on the web • uncertain about student privacy & safety	• 50% claimed to: – be not good autonomous learners – be not good in isolated environments – need f2f contact for learning

Table 4: Phase 2 Focus group questions and summary of student responses

Discussion Qs accompanying each scenario	Summary points emerging from student responses
• What suggestions can you give this student? • What do you see as being this student's problems in this unit? • What can they do now to complete this unit? • How would suggest they tackled things differently if they could start again? • If you could have given this student some advice before they enrolled in this unit, what would you say?	1 The importance of hands-on practical application and preparation "you gain confidence through doing" "you need prior preparation with computing skills" 2 The importance of scaffolding in becoming independent learners "we need more structure & assessment deadlines" 3 The importance of building and maintaining active participation in the community of learners (collaborative inter-dependence) "Take advantage of peer mentoring opportunities" (communities of practice) "Take advantage of multiple opportunities for mutual support" (affordances) 4 Awareness of the importance of meta-cognitive strategies: "You need constant practice to improve: • computing skills • study skills • time management skills • prioritising tasks"

Data from postings in student blogs and on the wiki reinforce the students' expressed need for assignment deadlines in order to help them stay on track. Postings on the Community Portal page of the wiki, where they decided to put Hints and Tips for other students also abound with suggestions for prioritising time and complaints about their own lack of self-discipline in this area. The number and frequency of mutually-supportive comments, general pleas for help on specific issues and advice gained from their own experience in student blogs is further evidence of the emergence of a cohesive and self-sustaining collaborative community. Full archives of student blogs and comments from Phases 2 and 3 can be accessed from the coordinator's teaching blog found at: http://lifentheuniverse.blogspot.com/ . The Phase 2 wiki site can be accessed at: http://collaborate.ci.qut.edu.au/techllwiki/index.php/Main_Page .

Semester 3: Refinements

As a result of the information collected in Phase 1 and especially Phase 2 of the study, a few modifications have been made to the Phase 3 implementation. These modifications fall into three main categories:

1. the re-instatement of deadlines and specified order for submission of assessment tasks
2. greater focus on theoretical underpinnings of pedagogical decisions relating to the use of technological tools for language learning
3. an international collaborative connection with a similar class at University of Calgary.

However, as this semester is currently still in progress, these results will be reported elsewhere.

Discussion

In Phases 1 and 2, students were surveyed using a questionnaire designed to elicit their perceptions of their competence and confidence in using various computer and internet applications and operations, their preferred learning styles and commonly used learning strategies as well as some general profile and background information. Two weeks before the end of semester in Phase 1, the program coordinator administered an anonymous questionnaire aimed at discovering students' levels of satisfaction with the course and their suggestions for improvement, while at the end of semester the standard university course evaluation instruments were used. These instruments included questions about course improvements, materials and assessment used, and scheduling and general usefulness of the course. Responses to these instruments were collated analysed electronically using tools associated with the LMS. In Phase 2, the anonymous questionnaire was replaced by problem-based student focus group discussions about their experiences and responses to the new mode of teaching, and assessment items in the course. These focus groups were based on problem scenarios derived from reported student experiences in the previous semester. The interviews were videoed, transcribed and analysed for key words relating to change, effectiveness of specific technological tools and inter-culturality as well as attitudinal responses.

In terms of expectations of the course, in the pilot and second phase, students came in expecting more to be given to them and done for them, to be given pre-organised packages of learning. The teacher expected students to think for themselves, learn by themselves, read teacher notes and notifications, read the set and suggested readings, and experiment with the tools. There were a number of areas of mismatch here. Though it was not a major focus in this study, as illustrated in Table 4 above, students reported and demonstrated the benefits of having developed skills in working collaboratively with their peers. Also illustrated in the Table 4 focus-group comments, students perceived the experience as collaborating as individuals – not just participating in teamwork, but rather coming in to the course with individual skills and expectations and emerging with differing individual outcomes, while having experienced collaborative inter-reliance.

Side-by-side with the achievements were also the disappointments. Students felt that they needed more time to achieve what they wanted than was available to them in a single semester. Most reported experiencing stress in all three phases, at the high learning curve necessary to acquire mastery of some tools. Some felt disappointed that they couldn't create a project to their own high expectations in the time available. These comments are evident in their blog postings, together with the positive mutually-supportive comments made to each other along the way. These sentiments are also very obvious in the final Discussion Forum responses to the Question on the value of WebQuests, which unfortunately, for privacy reasons, cannot be cited. In Phase 2, there were considerably fewer students than previously who felt they needed more hands-on practice or hand-holding. Conversely, in Phase 2, demand increased for theoretical discussions and students requested the re-instatement of assignment deadlines and a teacher-specified order of assessment tasks.

Conclusion

While the technology continues to develop, change and expand its uses so unpredictably fast, teachers at all levels employing technology to mediate teaching and their learners' learning, need to work on developing a flexible and adaptive pedagogy that suits their teaching philosophies and fits with the teaching and learning environments within which they work. As part of this flexibility and adaptability, we need to examine and reflect on the new personal and learning strategies that both learners and teachers themselves need to develop. This experiential modeling approach to familiarizing practicing teachers with technology seems to be a positive step towards engendering in teachers the competence and confidence to use new technologies with their learners to help them, in turn, to maximize their language learning. It has also been an exciting and tumultuous learning experience for the designer and teacher.

As we move towards offering an increasing range and variety of on-line, technology-mediated, and self-access language learning materials for learners at all levels of educational provision, it is important to remember and consider the needs of learners in actually utilizing these materials. In this study, this consideration has led to some new opportunities being embraced – new technologies, tools and scheduling. Choices and compromises have had to be made due to the shortness of the course, students' preferences and institutional constraints. Finally, a number of adaptations have been successfully implemented to allow us to find and utilize the affordances of what is available, both technological and human, and to identify areas where more can still be done.

References

Anderson, T. (2005). Distance learning – Social software's killer ap? Keynote presentation at the 2005 *Conference of the Open and Distance Learning Association of Australia (ODLAA)*, Adelaide, South Australia. http://www.unisa.edu.au/odlaaconference/PPDF2s/13%20odlaa%20-%20Anderson.pdf [viewed 18 December 2005].

Anderson, T. & Elloumni, F. (Eds.), (2004). *Theory and Practice of Online Learning*. Athabasca: Athabasca University Press. Available *http://cde.athabascau.ca/online_book/* [viewed 18 December 2005].

Barber, W. & Wilkinson, M. (2005). The change in academic skill base required for the transition from face-to-face teaching to blended delivery. http://www.unisa.edu.au/odlaaconference/PPDF2s/69%20odlaa%20-%20Barber%20%20Wilkinson%20abstract.pdf [viewed 18 December 2005].

Bird, T. & Rosaen, C. (2005). Providing authentic contexts for learning information technology in teacher preparation. *Journal of Technology and Teacher Education*, (13)2, 211–231.

Blythe, S. (2001). Designing online courses: User-centered practices. *Computers and Composition*, 18, 329–346.

Bower, J and Christensen, C (1995) Disruptive Technologies: Catching the Wave. *Harvard Business Review*, 17(1), 43–5.

Brook, C. & Oliver, R. (2005). Exploring pre-existing factors and instructor actions influencing community development in online settings. *Proceedings of the 2005 ODLAA Conference*, Adelaide. http://www.unisa.edu.au/odlaaconference/PDFs/40%20ODLAA%202005%20-%20Brook%20&%20Oliver.pdf [viewed 4 April 2006].Brown, A. & Voltz, B. (2005). Elements of effective e-learning design. The International Review of Research in Open and Distance Learning, 6 (1). [viewed 24 July 2006].

Christensen, C. (1997). *The Innovators Dilemma*. Boston MA: Harvard Business School Press.

Cochrane, C. (2005). Mobilising learning: A primer for utilising wireless palm devices to facilitate a collaborative learning environment. *Proceedings of the 2005 ascilite conference*, Brisbane. [viewed 4 April 2006].

Dvorak, J. C. (2004). The myth of disruptive technology. *PCMag.com*. Accessed 14/12/2005: http://www.pcmag.com/article2/0%2C1895%2C1628049%2C00.asp

Felix, U. (2002). The web as a vehicle for constructivist approaches in language learning. *ReCALL*, 14(1), 2–15.

Garrison, R., Anderson, T. & Archer, W. (2000). Critical enquiry in text-based environment: Computer conferencing in higher education. *The Internet in Higher Education*, 2 (2–3), 87–105.

Gibson, J.J. (1986). *The ecological approach to visual perception*. Hillsdale, NJ: Lawrence Erlbaum.

Hannon, J. & D'Netto, B. (2005). Cultural perspective in online learning. Paper presented at the 2005 Conference of the Open and Distance Learning Association of Australia (ODLAA), Adelaide, South Australia.
Hoven, D. & Sussex, R. (in press). CALL: Disintegration, integration, reintegration. *CALL Journal.*
Hughes, J. (2005). The role of teacher knowledge and learning experiences in forming technology-integrated pedagogy. *Journal of Technology and Teacher Education*, 13(2), 277–302.
Kanuka, H. & Anderson, T. (1999). Using constructivism in technology-mediated learning: Constructing order out of the chaos in the literature. In *Radical Pedagogy*, 1(2):
http://radicalpedagogy.icaap.org/content/issue1_2/02kanuka1_2.html [viewed 18 January 2006].Kirschbaum, D. (2002). Introduction to Complex Systems. in The Complexity & Artificial Life Research Concept for Self-Organizing Systems.
http://www.calresco.org/intro.htm. [viewed 4 April 2006].
Knapp, L. & Glenn, A. (1996). *Restructuring schools with technology*. Boston, MA: Allyn & Bacon.
King, K. P. (2002). Educational technology professional development as transformative learning opportunities. *Computers & Education,* 39(3), 283–297.
McLoughlin, C. (2001a). Crossing boundaries: Curriculum and teaching implications of culturally inclusive online learning. Paper presented at AARE 2001 http://www.aare.edu.au/01pap/mcl01720.htm [viewed 18 December 2005]
McLoughlin, C. (2001b). Inclusivity and alignment: Principles of pedagogy, task and assessment design for effective cross-cultural online learning. *Distance Education* 22(1), 7–29.
McLoughlin, C & Oliver, R. (2000). Designing learning environments for cultural inclusivity: A case study of indigenous online learning at tertiary level. *Australian Journal of Educational Technology* 16(1), 58–72.
Oxford, R. L. (1990). *Language Learning Strategies: What Every Teacher Should Know*. Boston, Mass.: Heinle & Heinle Publishers.
Passi, B. & Mishra, S. (2004). Selecting Research Areas and Research Design Approaches in Distance Education: Process issues. . *The International Review of Research in Open and Distance Learning,* 5(3). [viewed 24 July 2006].
Reeves, T. (1996). Technology in teacher education: from electronic tutor to cognitive tool. *Action in teacher education* 17, Winter, 74–78.
Reiner, R. (2005). The influence of media on the learning process – are we evolving or just revolving? http://www.unisa.edu.au/odlaaconference/PPDF2s/124%20odlaa%20-%20Reiner.pdf [viewed 18 December 2005].
Richardson, V. & Placier, P. (2001).Teacher change. In V. Richardson (Ed.), *The handbook for research on teaching.* (4th ed.), (pp. 905–947), Washington, DC: AERA.
Scholfield, K. (2005). The Magic Umu? Open and distance learning in three Pacific Island countries. Keynote presentation at the 2005 *Conference of the Open and Distance Learning Association of Australia (ODLAA)*, Adelaide, South Australia.
Steketee, C. (2006). Modelling ICT integration in teacher education courses using distributed cognition as a framework. *Australasian Journal of Educational Technology* 22(1), 126–144.
Thorne, S. (2003). Artifacts and cultures-of-use in intercultural communication. *Language Learning and Technology* 7(2), 38–67.
van Lier, L. (2000). From input to affordance: Social-interactive learning from an ecological perspective. In Lantolf, J. P. (Ed.) *Sociocultural theory and second language learning*. (pp. 245–259), Oxford: Oxford University Press.
Willig, C. (2001). Introducing qualitative research in psychology: Adventures in theory and method. Buckingham: Open University Press.
Willing, K. (1989). *Teaching How to Learn. Learning Strategies in ESL. A Teacher's Guide.* Sydney: National Centre for English Language Teaching and Research.
Zemsky, R. & Massey, W. (2004). *Thwarted Innovation. What Happened to e-Learning and Why.* University of Pennsylvania: http://www.irhe.upenn.edu/WeatherStation.html [viewed 24 July 2006].

Software

Atomic Learning: http://www.atomiclearning.co.uk/
Blogger: http://www.blogger.com/start
Hot Potatoes: http://hotpot.uvic.ca/
Swarthmore Makers: http://lang.swarthmore.edu/makers/
WebQuests: http://webquest.sdsu.edu/
Wikipedia: http://en.wikipedia.org/wiki/Main_Page

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Learning, study and review methods 101: A fun way to learn and study complex theoretical content

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This paper examines the development and implementation of a collaborative/game-based study format in a university context and the benefits gained by the students involved. The research project compared the established delivery format of lectures and tutorials with an alternative delivery format involving collaborative learning and games-based study tools. It examined the differences that these formats had on student learning outcomes for the heavily theoretical content of the Human-Computer Interaction in Multimedia (HCI) unit, as part of the Multimedia Bachelor Degree at Monash University.

A collaborative/game-based study format was developed to provide an interactive learning environment that allowed the students to explore the unit content using a variety of tools and resources, such as textbooks, internet, and discussion groups. To verify understanding, students contributed questions, based on the content researched, to the game-based study tools designed to enhance the study and review process. The treatment compared the results of students in each group (traditional vs collaborative) to their performance scores in a pre-test and post-test of the content area (short-term retention) and the results of the semester examination (long-term retention). Data gathered by survey was used to ascertain student opinions regarding both methods.

Keywords: games-based study tools, collaborative learning, teaching and learning strategies

Collaborative learning and game-based study

Analysing existing methods and resources

When teaching a heavily theoretical subject as part of a largely practical course, there are inevitably a number of issues to overcome. The most significant is encouraging the students to learn content that they perceive as irrelevant and boring, while working within the constraints of the University's preferred delivery methods. While student engagement with the content and resources is often quite evident during tutorial sessions, it is not always so during lectures. This observation provided the motivation to investigate alternative teaching and learning strategies that would enhance the learning process and provide a more effective format for teaching predominantly theoretical subjects.

The challenge was developing a format that would satisfy the needs of both the University and students. The obvious difference in the students' behaviour during the tutorials indicated that a suitable learning environment would focus on a more collaborative approach. However, to avoid experiencing issues similar to the current method over time, a novel approach was needed for learning and/or studying the material delivered – one that was interesting and fun for the students but also providing an appropriate level of instruction and learning for university. To ensure this, several of aspects of the current learning environments were examined with the following strategies / resources being identified:

1) What are the main delivery methods of units within the Multimedia degree course?
    a) A 1–2-hour lecture, followed by a 2-hour practical tutorial session, with students working individually or in small groups on small projects.
    b) A 1-hour lecture, followed by a 3-hour studio session, with students working in small groups on a single large project or prototype.
2) What tools do the students use most frequently while participating in learning activities?
    a) The internet and e-mail are the most frequently used tools for finding/sending information.

   b) The university also has an on-line facility called MUSO (Monash University Studies Online) that is accessible to all students, where materials related to the unit are posted. Discussion groups can also be created using this facility.
3) What support materials can be provided to students to help with learning the content delivered?
   a) The most common materials provided included the weekly lecture notes and tutorial activities, usually posted on MUSO.
   b) Other support materials included unit syllabus, assessment and tutorial briefs, and links to associated on-line reading materials.

Developing an alternative format

The concept of a student-centred environment is not new and the strategies for content delivery in tertiary education should reflect this ideal, to keep pace with both the needs and expectations of the current generation of students. Sander (2005) argues that with the changes in student demographics over the last decade, higher education institutions are being forced to review their current teaching strategies. This is particularly relevant, as tertiary institutions need to maintain higher numbers of students, and therefore need to implement appropriate strategies to cater for the needs of the diverse range of students now wanting higher levels of education. Sander (2005) further implies that the discrepancy between what future students perceive as a good education and current delivery strategies is causing disenchantment with the educational system, thereby decreasing prospective student numbers and the viability of many institutions. One way to improve this situation is to research, develop and implement new delivery strategies that suit both the needs of the tertiary institution and those of the student body. The author argues that these strategies must address two main issues: a) acknowledging that active student involvement is an integral part of the learning process and b) providing both interesting and flexible learning environments that engage learners with the content through a variety of resources and tools.

At Monash, the students within the Multimedia Degree are frequently exposed to different collaborative situations during tutorials or as the primary means of delivery, so it seemed a logical step to apply a similar format to the delivery of content usually given in lectures. However, most often lecture notes are not useful without the accompanying commentary, a fact many students berate if they miss one, and making them available on-line for later study does not guarantee that any learning will take place. While alternatives, such as recording or pod-casting lectures are supportive of student learning, they are not always available or may require a significant investment in time and effort to set up, as opposed to just posting on-line. Therefore, the collaborative/game-based study method (Figure 1) was developed to create a collaborative learning environment that provided guidance and support but also gave the students the freedom and flexibility to explore the content using tools and methods that were appropriate to them. In addition, an alternative method to support the study and review was provided, in the form of game-based study tools, to assist with the consolidation of the content learned (Howard, 2006).

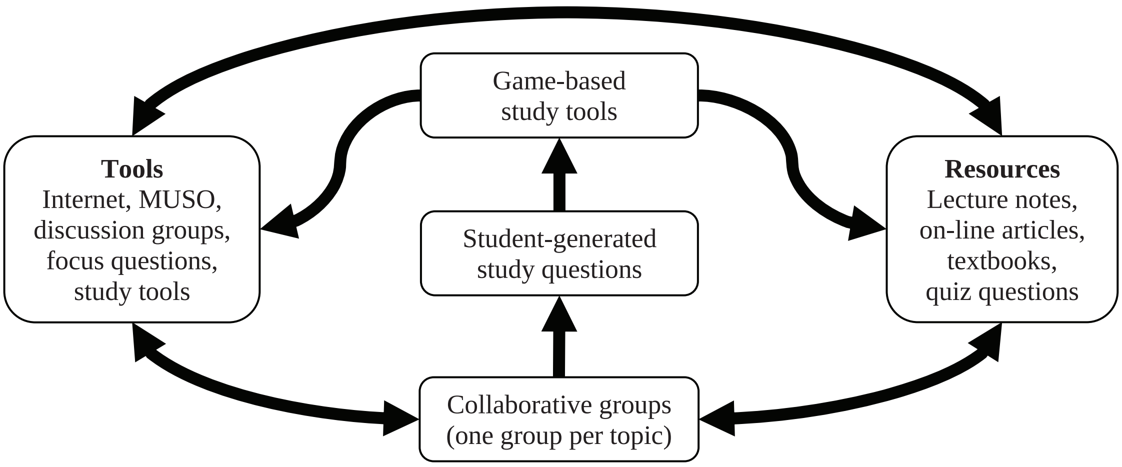

Figure 1: The collaborative/game-based study method

Race (2001:26) states that "We need to remember that learning is done by people – not to them." This implies that the current lecture format may not necessarily engage the students as actively as other strategies may, largely due to its relatively passive nature. Race (2001) also argues strongly for using strategies that students understand to support effective learning. This suggests that using tools and structures with which the students are familiar is a more appropriate strategy to adopt, as they already have some skills with which to undertake learning activities. Sander (2005) supports this argument stating that for universities to ensure their undergraduates are independent or autonomous learners, they must provide learning environments that promote both effective and independent learning. The focus must be on a student-centred approach, where students are actively engaged with the subject matter rather than passively "listening to 'an expert' about it" and are "inclusive of all students by providing teaching methods and learning environments that reach all students" (2005:117).

The proposed format substituted a collaborative learning environment with on-line research, held in a studio/lab rather than a lecture theatre, in lieu of the normal lecture. The students were divided into small discussion groups of 3–5 members, in which individuals were encouraged to participate in a variety of roles to enhance the experience, such as researcher, discussion leader, note-taker, etc. The content of the "lecture" was divided into five sub-topics with one selected by each group, allowing individuals to explore a topic based on an area of interest or familiarity of the group members. The tools available included access to a word processor, the internet and an on-line discussion group specifically created for this purpose. Students were free to use other tools as they deemed appropriate, provided session outcomes were met. However, an argument for caution when using technology becomes an integral part of the teaching process is proffered by Kiili (2005) – that the technology can often become a substitute teacher for delivering information rather than as "learning tools that support the active learning process" (Kiili, 2005:303). While computers are good for delivering content in a variety of ways, whether efficiently or not, there needs to be a balance between information delivery and achieving the required learning outcome(s) with supporting and enhancing the learning process (Facer, 2003; Grabinger & Dunlap, 2000; Quinn, 2005).

Key components

An integral part to the learning process is being able to understand the information presented and process it so that it becomes meaningful to the individual (Aldrich, 2005; Grabinger & Dunlap, 2000; Harper & Hedberg, 1997; Oblinger, 2004; Papert, 1993; Prensky, 2001; Quinn, 2005; Race, 2001). Harper and Hedberg (1997) also argue that educators should "view the learning environment as something the learner has a major impact upon, the process has to include the learner as an active participant." Numerous studies have examined ways in which to encourage learners to be active, such as problem, case and scenario based learning using authentic tasks/content (Cunningham et al., 1993; Grabinger & Dunlap, 2000; Schunk, 2004), and more recently the introduction of simulation and games-based learning (Aldrich, 2005; Prensky, 2001; Quinn, 2005).

Therefore, a key component to making the proposed format work was for students to link the resources provided, in an organized manner, to their research of the weekly topics. To ensure some consistency between groups, weekly focus questions were prepared that related to the topics covered in the lectures, including at least one reference or link to an appropriate resource. However, the groups were free to explore and discuss these questions, using any of the resources provided and/or others discovered during their research. Each group had to post their answers to the group discussion board for others to revise and study, and were required to ensure that the following criteria were met: a) each answer had to provide an adequate response to the question; and b) have clearly identified reference(s) used.

In order to enhance individual learning, the lecturer's role became one of a facilitator so that the students could be more actively involved with the resources and have a certain degree of autonomy over how they would use them. The links for the focus questions were only provided as a starting point – the students were free to pursue other sources if they believed that they would support the answers to their topic's questions. While these strategies promoted engagement with the content, they could not necessarily ensure the quality of the learning, if any, taking place. Thus, for this format to address the issue of effective learning, the following two additional strategies were implemented:

- The first investigated the development of some game-based study tools to support the consolidation of the learning taking place during the collaborative sessions. Due to the students' perception that the content of the unit would be boring because it was mostly theoretical, these tools had to also provide an interesting and fun way to study or review the complex content. To ensure compatibility with the developed study tools, the Focus Questions were divided into five categories related to the current topic with a minimum of four questions each.

- The second explored the concept of the students generating the content for use within the game-based study tools. This strategy was designed to enhance the processing of the information learned by the creation of questions related to the researched topic – the premise being that in order to ask a valid question one must first understand what is being asked. It was also to challenge the students to meet specific criteria when creating the questions in order to promote higher-order thinking skills.

Format overview
The collaborative/game-based study method (Figure 1) used the following format during each session (Howard et al., 2006a):

1) Students formed random groups of 3–5 members – these can be based on areas of interest (e.g.: by topic) or familiarity (eg: with friends).
2) Each member was encouraged to take on varying roles within the group (eg: researcher, discussion leader, note-taker, etc.) to ensure that their experience encompassed a broad range of learning opportunities.
3) Each group selected one category that they thought interesting to pursue.
4) For approximately 45 minutes, the group could explore the questions and answers using the resources provided and/or other relevant sources discovered during the research process, ensuring that the following criteria were met:
a) the answers had to provide an adequate response to the question
b) providing clearly identified references
5) At the end of this time, each group would post their answers to the discussion board provided, for others to revise and study.
6) Finally, each group was provided with an instruction sheet and examples of the eight question formats to be used. Using two or more of these Q&A formats, each group would create and submit by e-mail at least four questions related to their research topic for use in the game-based study tools. The use of T/F, and multiple choice questions was limited (one of each only) to encourage the use of the other formats to improve the range of questions to challenge the students and promote different levels of thinking.

The questions also had to meet the following criteria:

a) a clearly phrased question with clearly identified correct answer(s)
b) the reference(s) used
c) and a short feedback description explaining why the answer was correct

The student-generated questions were entered into the question databases for the study tools using a question & answer generator specifically developed for this purpose (see: *Game-based study tools*). The study tools provided the students with an enjoyable means by which to study the material that was researched by their own and other groups. The tools were available for the use during the first half hour of their assigned tutorial time (while students in the control group or not participating were given time to answer the Focus Questions) or for individual study when reviewing or preparing for assessment later.

An advantage of using the study tools was that if a question required further investigation by the student, they could:

- review the initial resources provided for the specific focus question topic,
- review the postings on the discussion board that relate to the specific question/topic,
- use the feedback provided to help them understand the concept / topic / question,
- provide constructive comments, via the discussion board, on the information posted by other groups (e.g.: requesting clarification, adding additional resources/information, etc.).

The main thrust of the research was to determine whether the inclusion of collaborative learning using game-based study tools was a valid alternative mode of delivery that can promote student engagement with the delivered content. According to Kiili (2005) when part of the creation of the learning materials is incorporated into the instructional design then "the processes employed to produce these materials are likely to engage students and enhance learning in certain conditions." (2005:319). The rationale behind using this game format was to motivate the students to take an active role in their learning, to improve retention of the subject matter, and to encourage the motivation to learn within individuals and the results would support this. In this type of environment "students can acquire knowledge and skills that are not the consequences of rote learning or of memory or abstractions devoid of personal experience but rather acquired in a way that is interrelated and gives personal purpose to present and future" (Ziegel, 2004:106).

Developing the game-based study tools

The initial concept for the games-based study tools was inspired by Marc Prensky's games2train website where it "marries computer games and educational content into a new "Nintendo Generation" approach to learning … the underlying idea is that students learn better when they are having fun and are engaged on the learning process" (Spectre & Prensky, 2001). Prensky (2001) advocates that games can be used to present any content in a fun and interesting way to help students learn and/or study, even complex theoretical information. However, a significant limitation of the Prensky games was the limited types of questions offered – T/F, multiple choice (single answer) or multiple choice (multiple answers), catering for a fairly limited level of cognitive processing – often a best guess rather than a thought out response.

For the proposed game-based study tools to be effective, provision had to be made for students to engage in a broader range of thinking skills. To cater for the different levels of cognitive processing required, eight different question formats were devised to broaden the variety of the types of questions asked and to maintain student interest. These formats included: true or false, multiple choice with single answer only, multiple choice with multiple answers, fill in the blanks, short answer, sequencing, matching pairs, and a Likert sliding scale. All question formats allowed for the inclusion of images and/or sounds to provide alternatives to what could become predominantly text-based materials. Other features included provision for references, as web links or electronic documents, and a space to provide comprehensive feedback. To ensure that question creation would be a simple process *and* compatible with the game-based study tools a 'question and answer generator' (Figure 2) was developed.

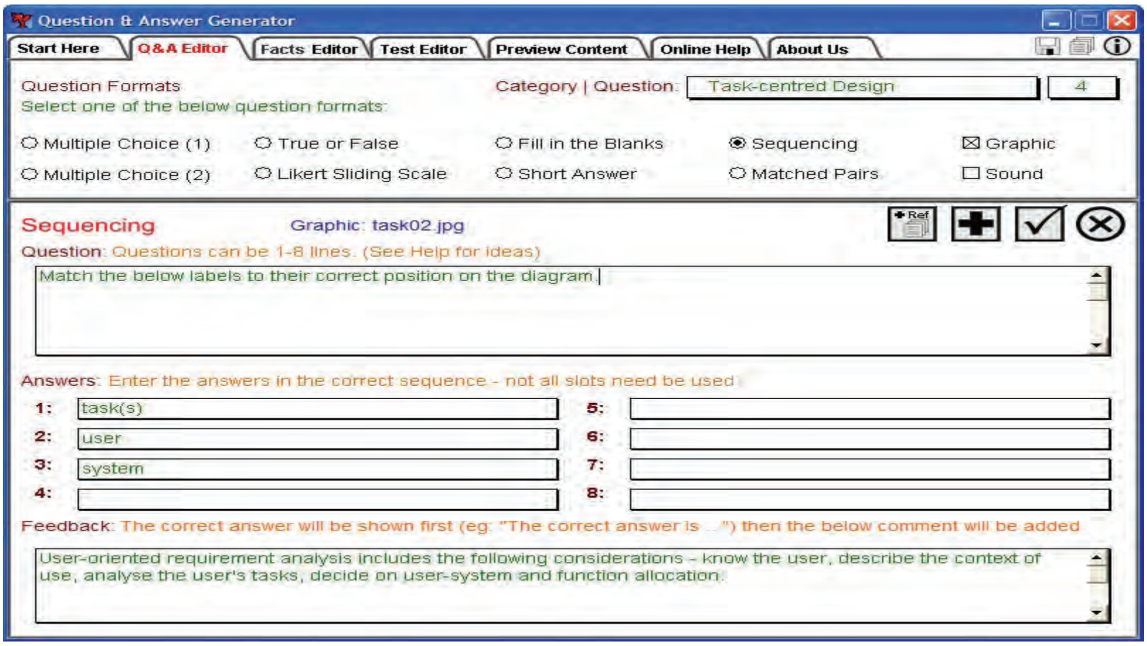

Figure 2: Q&A generator interface (Howard *et al.*, 2006a)

The structure of the “quiz” content is defined by a broad subject heading (eg: HCI), then divided into specific topic areas (eg: What is HCI?, Task Analysis, etc.), and still further divided into five categories, breaking the content into manageable learning chunks. These categories relate directly to the topics researched by the students with the aid of the Focus Questions. In addition, for the application to be suitable across disciplines and useful for those who wish to customise their own subject data, complete documentation was developed to provide simple instructions on how to use the Q&A generator and suggestions for maximising effectiveness of the question formats. These suggestions demonstrate that by varying the complexity of the questions asked, higher order cognitive thinking and processing can be encouraged, and therefore would increase the value of the questions and challenge students to think carefully before answering (Howard et al., 2006a).

For the games to be effective, a number of issues had to be addressed. Firstly, the games themselves were only intended to be the vehicle by which content created by the students (and/or teacher) was accessed. They were *not* designed to be an encapsulated learning environment but rather an adjunct to the format developed, as the majority of the learning would take place during the collaborative research and question creation. The advantages the study tools provided include engaging the students more effectively with the content being taught, the potential to promote higher order cognitive thinking and processing, to make the questions more meaningful. Extending the experience by adding the student-generated content to MUSO facility for use when studying and allowing students the opportunity to debate, challenge and discuss their content.

Secondly, to reduce the effect of cognitive load (Chandler & Sweller, 1991) when learning how to use the study tools, the development of the games was guided by the principles of simplicity and familiarity whereby the rules of the games were easy to learn and master and the game play would be familiar to a large number of users. This design was to allow students to focus separately on the two aspects of the games – playing the game and learning the content. Therefore, the following types were chosen to develop:

- two arcade games for individuals – a variation on a Pac-man style game and a version of a space invaders style game;
- one turn-based game for those who prefer a controlled pace or playing against another player – a Pick-a-Box style game (Figure3).

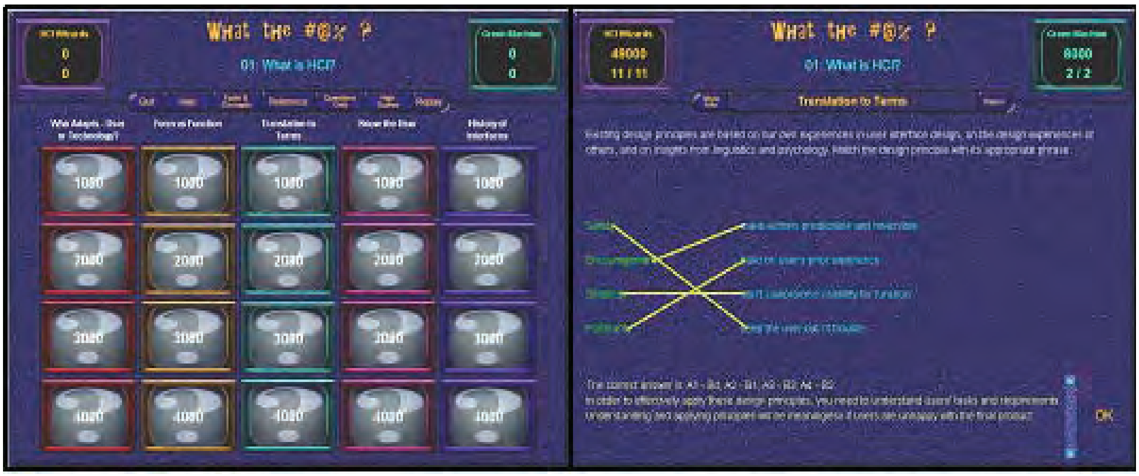

Figure 3: Game-based study tool interface

In the arcade style games, the students play until they complete a game level (e.g.: eat all monsters). To continue, they must then answer four questions correctly from a non-repeating randomly selected category. This approach was used to maximise the players' focus on the question content rather than interspersing it throughout the game level and interrupting game play. In the turn-based games, the students select an action, governed by the game rules, and answer a question taken from either the selected category or a non-repeating randomly selected category. The turn-based game also has a 2-player mode to cater for those who like to compete against another player or as teams of players. Play continues until twenty questions have been answered in both game formats.

Other features built into the study tools include the provision for immediate feedback once the student checks their answer by clicking the OK [☑] button, access to links of associated references, a question only mode, reviewing facts and concepts only mode, and pop-up game help.

Experimental treatment

The mode of delivery for the majority of courses in the Multimedia Bachelor Degree is a lecture followed by a tutorial. Working within the budgetary constraints of delivering a course to a large body of students (98) with a small staff (3) and timetabling constraints due to limited availability of rooms a strategy had to be devised (Table 1) that would also ensure that students were not deemed to be disadvantaged by the process (Howard, 2006).

Initially, all students attended the lectures and tutorials, as they would normally be given using the current Lecture/Tutorial format. The purpose was to introduce the changes to the instruction used during each session, preparing the control group participants, as follows:

1) Students attend the weekly lecture that introduced the content to be covered (1–2 hours)
2) Students attend their scheduled tutorial (2 hours)
3) The first ½ an hour was allocated for the answering of the Focus Questions to consolidate the content delivered during the lecture:
   a) The Focus Questions sheets were available on MUSO
   b) The students were encouraged to answer as many questions as possible, using a variety of resources (their own notes, the posted lecture notes, the textbook and readings)
   c) They were permitted to work together, if they wished
   d) The final 1½ hours for the pursuit of the normal tutorial activities, usually practical activities related to the assessment tasks.

Table 1: Proposed research timeline

Week	2	3	4	5	6	7	8	9-13	14
Con	Lecture / Tutorial			Lecture / Tutorial			Lecture / Tutorial		Exam Period
Exp	Lecture / Tutorial			Collaborative / Game			Lecture / Tutorial		
Data			Survey 1 Pre-Test				Survey 2 Post-Test		Final Exam

At the end of the first three weeks, students completed a practice quiz (pre-test) on their understanding of the topics covered. A second practice quiz (post-test) was also conducted at the end of the second three weeks (Table 1). At the start and end of the second three-week period, all participants completed a survey about their learning experiences and the different delivery methods. The results of these quizzes did not constitute part of the normal assessment for the unit (Howard, 2006).

Results from student feedback

As part of the experimental treatment implementing this method, the participants were asked to provide feedback about the delivery of content in two surveys and by undertaking a pre- and post-test. Due to the relatively small sample size, the test results produced statistically non significant results and were inconclusive. However, the feedback from the surveys did provide some interesting information.

The following summary is of the data collected from the second survey (Figure 4) specifically relating to the participants (*n*=24) attitudes towards the use of the collaborative learning environment (1–2 hours), in lieu of lectures, and followed by a 2-hour tutorial.

Some 75% of the participants in the experimental group found participating in the discussion groups both useful in general and for learning new information, with 66.7% indicating that they preferred this method for learning new information, suggesting that this method more suitable to their needs. A large portion of participants (70.8%) found posting their notes on-line during the discussion group helped them to study later, and 54.2% found the notes posted by others also helpful to their study. Some 62.5% found the using the Focus Questions useful for exploring and understanding the content. This would suggest that the change of delivery method, including access to a greater range of note taking tools such as computers, word processors, e-mail and discussion groups, may have encouraged a more effective use of the Focus Questions as a resource – from 38.1% prior to the treatment to 70.8% after the treatment.

Perhaps one of the most significant findings of the study was the experimental treatment appeared to be well received by almost all the participants. In particular, 87.5% of the participants found discussing and creating the questions for the study tools helped with remembering the information learned and 79.2% found the games a useful study tool. This would suggest that nearly all the participants found the combination of collaboration and the game-based study tools quite effective and useful to them. It may also indicate that the method is more suited to a greater range of learners by providing a practical hands-on learning environment even though the content is largely theoretical.

The combination of discussion groups and Focus Questions was deemed an effective way to learn by 66.7% of participants with 62,5% also finding this an effective way to study the content. Motivation to find out more information about the topics presented from other sources (e.g.: readings, set texts, internet, library, etc.) increased from 14.3% (pre-treatment) to 37.5% (post-treatment). This was the second major finding to emerge from this study potentially indicating that a greater proportion of the student population where motivated to seek out further information and therefore become independent learners. The change in attitude towards using the Focus Questions and an increased motivation to explore other sources of information may be directly related to the increased level of engagement the participants have with the content and being able to interact with a variety of resources in a more meaningful context.
There was a strong indication that the experimental treatment of the collaborative/game-based study method provided greater support for a greater range of learners. The participants also demonstrated a strong change in attitude towards the value of the resources available to them for learning the content. The provision of an active learning environment, allowed the participants to use the Focus Questions more effectively to help them learn, summarise and understand the content presented from a variety of resources. Having immediate access to tools, such as a word processor, discussion boards and e-mail, may also have improved some of the participants' attitude toward the importance of note taking. The value of the game-based study tool may also have increased by the participants being actively involved in the creation of the content used within them, helping nearly all of them (87.5%) to remember the information studied more clearly.

The experimental participants were also asked to express opinions on their experiences with the new method. This included identifying both the aspects they liked and problems or issues they experienced while learning. The types of responses mostly focused on the content delivery, the focus questions and using the games. Following are some student responses on these aspects of the method:

- Quite a number of participants found the discussions most useful for analysing, understanding and remembering the content – "I like getting other people's views and understandings of the information we're learning. In a subject area where there are no black and white answers, it is really difficult to develop an understanding on your own."
- Some participants found the learning environment was also more enjoyable for them being "very user friendly, relaxing study environment, and most importantly the teacher was very useful."
- Other participants commented on sharing the workload as a positive element – "The idea of having groups to answer different section of the questions was a good idea. Having it posted to MUSO helps me to study later."; "We interact (with) each other and try to find the answer together. It is fun!" and "The learning was more fun because you had to actively seek it out. Working in groups means the information was easier to find since everyone was helping."

- For one student, "It was an unusual experience to approach learning this way, particularly since the timeframe was so short. I enjoyed it a lot, but it would have been better if it had gone longer."
- A number of participants sometimes found the discussions difficult because they had difficultly communicating with others, found the process confusing or "It only takes one completely uninterested discussion group member to make meaningful discussion impossible."
- Some participants also found the researching the focus questions for only one topic was perhaps not an effective means of studying "because we only researched a portion of the content ourselves, we ended up having a disparity in levels of knowledge between different content sections."
- Some also thought the posted answers "… did not help much because they did not contain useful information" or "some of the information posted was not enough detail or completely correct."
- For some types of learners, this method may not have been particularly suitable – "I like to have my own written notes from lectures, something that I can interpret into my own words. Due to time constraints I found most groups had highly summarised research content which is in their own words so I'll still have to go through old lecture slides and find out the full info for myself."
- A number of participants as found "The game based (study tool) certainly a more fun way of learning the content."
- Some also found that the repetition of the questions through the games was helpful for remembering the content, chunking the information better for learning or an indicator for what was not known by "Playing the game before being presented with the content allowed me to focus better on the content itself."
- On the other hand, some participants found that "some questions made by students were hard to understand or made no sense at all" while others found some issues with the games being too slow or buggy.

Conclusions

Engaging students in creating content for the game-based study tools encouraged a deeper level of learning. Even though a small sample, observations and survey responses indicate that the collaborative / game-based study format had a positive effect. However, its application to larger groups may be logistically difficult to implement due to the need for increased resources – one lecturer and theatre vs a number of computer labs with tutors. On the other hand, the long-term benefits gained by the students may well negate this issue, particularly with the observed increase in student interest with the content being taught. The data suggests that by increasing the student interactivity during the delivery of theoretical content, it may increase student levels of motivation to learn because they can process the content in ways that make sense to them and this may be significant in overcoming their perceived shortcomings of the current format.

Perhaps the most significant finding of the study was that 87.5% of the participants in the experimental treatment found discussing and creating questions for the game study tool helped them to remember the information they had learned and 79.2% found playing the games a useful study tool. This demonstrates strong support for using a combination of collaboration and the game-based study tools as the participants found this to be quite effective and useful to them. The other major finding was the increase in motivation to find out more information about the topics presented from other sources (e.g.: readings, set texts, internet, library, etc.) of the experimental group from 14.3% (pre-treatment) to 37.5% (post-treatment). This would suggest that providing opportunities for students to actively engage with a variety of sources of information relevant to their learning using familiar tools (e.g.: computers, word processors, e-mail and discussion groups) prompted a greater proportion of the student population to become more motivated to seek out further information and therefore become independent learners. An additional benefit may also be the improvement in note taking skills.

The implementation of the Focus Questions to guide study and aid revision was deemed successful with 57.1% (control) and 70.8% (experimental) of students finding them helpful. The inclusion of the Focus Questions to help guide the students through their study and understanding of the content could be implemented for large groups quite easily. The questions combined with a collaborative research and/or discussion session may improve both the interest and motivation of the students to learn complex theoretical content. Many students, from both the control and experimental groups, commented that they felt these questions helped them focus their study of the content (Howard et al., 2006a).

The level of student satisfaction, engagement with the material and motivation to learn was markedly different between the groups, particularly during the experimental period. This had a flow-on effect for a few weeks after the conclusion of the experiment in that a number of students from the experimental group continued to work in groups on the Focus Questions at the beginning of the tutorials. This would suggest that these students found the collaborative format useful to their learning and understanding of the content and wanted to continue using it even though there was no further requirement to do so (Howard *et al.*, 2006b).

Despite some initial issues with implementing software on a network, most of the participants found the game-based study tools provided them with a novel way in which to engage with the complex theoretical content required for the unit. Observations indicated that the combination of the games and the generation of the questions for use within them became a key element in increasing the students' level of interaction with the resource materials and their motivation to learn the content. The potential of this format to provide an adaptable alternative method for delivering complex theoretical content is quite high.

References

Aldrich, C. (2005). *Learning by doing: A comprehensive guide to simulations, computer games, and pedagogy in e-learning and other educational experiences*. San Francisco: CA: Pfeiffer.

Chandler, P., & Sweller, J. (1991). Cognitive load theory and the format of instruction. *Cognition and Instruction*, *8*, 293–332.

Cunningham, D. J., Duffy, T. M., & Knuth, R. (1993). The textbook of the future. In C. McKnight, Dillon, A. & Richardson, J. (Ed.), *Hypertext: A psychological perspective*: Ellis Horwood.

Facer, K. (2003). Computer games and learning. Retrieved 24/06/2005, from http://www.nestafuturelab.org/research/discuss/02discuss01.htm

Grabinger, R. S., & Dunlap, J. C. (2000). Rich environments for active learning: A definition. In D. Squires, Conole, G. & Jacobs, G. (Ed.), *The changing face of learning technology* (pp. 8–38). Cardiff: University of Wales Press.

Harper, B., & Hedberg, J. (1997, December 7–10). *Creating motivating interactive learning environments: A constructivist view.* Paper presented at the 13th ascilite conference "Reflections in Learning with Technology", Perth.

Howard, C. (2006). *Games and learning. Does this compute?* Unpublished Masters of Information Technology, Monash, Melbourne.

Howard, C., Morgan, M., & Ellis, K. (2006a). *Does games-based learning enhance the learning process of complex theoretical subject matter?* Paper presented at the AusWeb06: Making a Difference with Web Technologies (1–5 July), Noosa, Australia.

Howard, C., Morgan, M., & Ellis, K. (2006b). *Games and learning. Does this compute?* Paper presented at the ED-MEDIA 2006 Conference (June 26–30), Orlando, Florida, USA.

Kiili, K. (2005). Participatory multimedia learning: Engaging learners. *Australiasian Journal of Educational Technology*, 21(3), 303–322.

Oblinger, D. (2004). The next generation of educational engagement. *Journal of Interactive Media in Education* (2004 Special Issue on the Educational Semantic Web).

Papert, S. (1993). *Mindstorms children, computers and powerful ideas* (2nd ed.). Cambridge, Massachusetts: Perseus Publishing.

Prensky, M. (2001). *Digital game-based learning*. New York: McGraw-Hill.

Quinn, C. (2005). *Engaging learning: Designing e-learning simulation games*. San Francisco, CA: Pfeiffer.

Race, P. (2001). *The lecturer's toolkit a practical guide to learning, teaching and assessment* (2nd ed.). London: Kogan Page.

Sander, P. (2005). Reaching our students for more effective university teaching. *Electronic Journal of Research in Educational Psychology, 5–3*(1), 113–130.

Schunk, D. (2004). *Learning theories an educational perspective* (4th ed.). Upper Saddle River, NJ: Pearson Merrill Prentice Hall.

Spectre, M., & Prensky, M. (2001). Theoretical underpinnings of games2train's approach. Retrieved 9/12/2004, from www.games2train.com/site/html/theory.html

Ziegel, M. (2004). *Preparing teachers for the challenges of technology integration.* Paper presented at the Informing Science and Information Technology Joint Conference (25-28 June), Rockhampton, QLD, Australia. Retrieved 24/10/2006, from http://proceedings.informingscience.org/InSITE2004/024ziege.pdf

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Reflective practice in lesson design

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This paper recounts our reflections on the design and delivery of a unit of study at masters level. Information Technology and Teaching-Learning Process was delivered in a blended approach with the combination of face-to-face meetings and online sessions. The paper describes how the instructors engaged in "reflection on action" advocated by Schön and their efforts in bridging the gap between the standpoints of the students and that of the instructors by elaborating the rationales behind the design, providing technical support, modelling, creating opportunities for reflection and constantly making adjustments to meet the students' needs. Through continuous reflections, the instructors gained deeper understanding of the curriculum.

Keywords: reflective practice, teacher education, constructivist learning, teacher learning

The ability to reflect is often regarded as an important attribute of an effective teacher (Posner, 1996; Borko, Michalec, Timmons & Siddle, 1997). When teachers model thoughtful and collaborative inquiry through reflection on their own practice, they are in a better position of meeting students' needs (Loughran & Russell, 1997). Reflective practice also helps teachers to be critical of their assumptions and open to examining new beliefs and practices. This paper reports our learning journey of designing and delivering a core unit of study at master's level. The discussion is based on the class that the authors co-taught in the first semester 2006.

Theoretical framework

The importance of reflection in teaching has been documented extensively in the literature (LaBoskey, 1994; Zeichner & Liston, 1996). Reflection, as defined by Dewey (1933), is "turning a subject over in the mind and giving it serious and consecutive consideration," and it enables us "to act in a deliberate and intentional fashion" (p.3).

Schön (1990) indicates that reflection develops in a hierarchical manner. He makes the distinction between "reflection on action" and "reflection in action". "Refection on action" refers to thinking that occurs either before or after a lesson, whereas "reflection in action" is thinking during the act of teaching. Reflective practice is thought to open up the possibility for greater understanding of the complexities of classroom life and thereby provide the basis for improvements in teaching (Schön, 1987; Zeichner & Liston, 1996).

Context

Information Technology and Teaching-Learning Process is a core unit of study for the master's degree in education at the University of Sydney. The aims of the course are to help students to develop a basic understanding of the impact of various learning theories on the design of information communication technology (ICT) mediated teaching/learning activities. By relating their own practice of using ICT to research literature, students learn theories and are prepared for meaningful ICT integration. In the first semester 2006, seven students enrolled in this unit of study. Although it is not a new unit of study, it was the first time that the two authors taught it and also first time to work together.

Two different standpoints

When it comes to learning, teachers and learners may have very different aims, meanings and values, or different standpoints (Dewey, 1900). Our students were mostly classroom teachers, and they signed up this unit of study for practical reasons. Some expected to learn specific technical skills. Others wished that we would teach them specific ICT integration strategies that they could immediately apply to their classrooms.

We, the instructors, on the other hand, had a different standpoint. We support the notion that the teachers who actively integrate ICT into teaching/learning are more constructivist in philosophy and practice (Becker & Riel, 2000). We believe that the best way of preparing our students for ICT integration would be introducing them to the paradigm of constructivist learning and exposing them to the works developed from such a paradigm. Instead of devoting the class time to lecturing theories and teaching technical skills, we believed that the theories and skills should be learned through engagement in activities using ICT.

Bridging the gap

Apparently, we needed to convey our rationale to the students and bridge the gap separating our standpoint from that of the students. At our first face-to-face meeting, we explained to the students about the reasons behind our intended approaches. Up to this point, most of our students had no prior experiences in constructivist learning; therefore, the initial explanations did not make much sense to them. To continuously communicate our intentions to the students, we had an asynchronous online forum open the entire semester inviting the students to provide comments, and raise questions and concerns about how the unit of study was designed and delivered. In addition, we asked the students to answer a reflective questionnaire every other week. By having these communication channels open, we welcomed the students to evaluate our standpoint and at the same reflect on their own.

Reflecting on belief systems

We followed the suggestion by Dewey (1900) that teachers should help learners make sense of the curriculum in the context of their current knowledge and experiences. As classroom teachers, our students brought with them valuable classroom teaching experiences. We prompted them to share the stories of their attempts in integrating ICT into teaching while surveying the literature on teachers' belief systems. As the discussion went on, the students reached a consensus that the way they used ICT was closely related to their beliefs on what teaching/learning was all about and how they viewed the potentials of ICT for teaching/learning. Our subsequent discussion on constructivism and its implication for teaching/learning with ICT became natural and made sense to the students.

Technical support

Our online sessions were carried out by means of synchronous chat and asynchronous discussion forums through Lrnlab, a learning management system developed by the CoCo Research Centre, the University of Sydney (Ullman, Peters & Reimann, 2005). Prior to joining the class, some students had used chat for social purposes. This led to our faulty assumption that the students would automatically transfer whatever they knew about chat to the context of formal education. We were proven wrong. Our first chat session was rather disorganized and the students doubted whether online chat could be used for learning. Evidently, a different set of skills was needed when chatting for formal education in a group context, and the students' lack of such knowledge and skills prevented them from thinking critically and participating actively. At the beginning of the second chat session, we showed the students a chat protocol, which included the procedures such as "using '?' to indicate you have a question" and "using '!' to mean you would like to answer the question". To our delight, most students started to use the protocol right away, and our chat session became much smoother. To help a couple of students who were still not confident in using chat, we offered additional help by inviting them to the lab during the online sessions. Making us available (face-to-face) on the online sessions brought up some concerns. We were afraid that the students would become so dependent that they would want us to use the same way to teach each new skill to be introduced in the class. It soon turned out that our worries were unnecessary. As the students became more comfortable with technology, they seemed to be less fearful of making mistakes and were more enthusiastic about trying new skills. Perhaps, knowing that we were always available to help also contributed to this change.

Modelling

In addition to synchronous and asynchronous discussion, we also introduced the students to the use of a collaborative writing tool, concept mapping tool and wiki technology. When introducing each new technology, we explicitly modelled how it could be used and integrated into teaching. We provided examples of the required performances and demonstrating the most important steps and procedures. The students imitated our performances for a while, but their imitations ceased soon after they got a hold of the new skills. One such example was to facilitate asynchronous discussion forums. The students were told at the beginning of the semester that each one of them would moderate one asynchronous discussion forum. We, then, divided the class into two groups. Each one of us led one group discussion by modelling how a moderator could facilitate group learning process. We modelled various facilitation techniques, such as asking questions and providing guidance. Soon, the students were confident enough to take turns in moderating their own discussion forums.

Collaborative learning
An online collaborative learning environment allows for the joint construction of knowledge and sharing the cognitive load, thus facilitating higher levels of learning (Ploetzner, Dillenbourg, Preier & Traum, 1999). The possibility of exchanging multiple perspectives forces learners to engage with ideas in a deeper sense (Anderson, 2003). We believed that the students would need to taste the benefit of computer-supported collaborative learning before they would consider adopting it for their teaching. We utilised all the possible situations to create an online environment where the students felt comfortable working collaboratively. The students collaboratively created a group wiki page, which allowed them to share their perspectives on the same reading. They also had opportunity to complete a concept map using whiteboard to summarise a paper they had just read. All the students' assignments were deposited in the assignment folder on the course website which could be viewed and commented by other students. Through these hands-on experiences, the students gained new skills of using various ICT tools. More importantly, they learned how to use these tools to build a learning environment where learners could benefit from peer interaction and working collaboratively.

Reflection
Throughout the semester, two of us instructors met on weekly basis to reflect on what had happened in the class and discussed about the strategies to improve the unit of study. Frequent reflection made us aware of what was going with the students' learning, and it enabled us "to act in a deliberate and intentional fashion" (Dewey, 1933, p.3) in modifying our learning activities. Although at one point we were concerned about the students' reactions to our frequent adjustments to the original plan, worrying that the students would think we were inconsistent, we soon realised that such a concern was needless. In the contrary, the students welcomed our flexibility to meet their learning needs. Our openness modelled another way of teaching in which teachers were critical of their assumptions and open to examining new beliefs and practices.

Reflections on our journey

Looking back at our journal in designing and delivering the unit of study, we have learned a number of lessons. First, we learned that meaningful learning experience starts from synchronising the standpoints of both teachers and students. As teachers, we need to inform students of the rationale of our course design, especially when it is based on a domain unfamiliar to them. When students seek understanding of what is being learned, they are more likely to engage in deep learning. It has been proven that there is a positive relationship between perceptions of worth and a deep approach to learning (Goodyear, Jones, Asensio, Hodgson, & Steeples, 2005).

Secondly, teachers need to provide extensive modelling when introducing new concepts and the use of technologies. We should always provide opportunities for students to observe and learn new knowledge by participating in technology-rich instructional activities. Often, students only view one dimension of technologies. They see technologies as machines/tools but neglect their potentials for teaching/learning. When they have problems with technologies, they would say that they have not learned anything and that everything is going too fast. Only after they become more comfortable with technologies do they start to feel that they have learned more and the lessons are more productive. The challenges for us instructors are to provide appropriate scaffolding so that the transition between the two stages is shortened.

Thirdly, teachers should constantly reflect on action, and be observant of what is going in the classroom and with students. When we are constantly trying to improve our teaching practices, we are more critical about our lesson plans and ready to make modifications whenever necessary. Reflective practice provided us with the basis for our improvements in teaching, and it increases the chances for successful student learning.

Finally, when designing online content, it is important that we take a dynamic approach (Sims, Dobbs & Hand, 2002). Instead of adhering to prescribed content, we should be ready to redefine the online content “by participants and subsequent interpretation and construction”, and to make changes during the delivery cycle (p. 138). In other words, the design of online content should suit the context where learners are situated rather than that our particular experiences.

The experience of designing and delivering this unit of study further convinced us that constructivist learning could make learning experience more motivating and interesting. No doubt, the lessons learned in the process will help us in our future teaching activities.

References

Anderson, T. (2003). Modes of interaction. In M.G. Moore & W.G. Anderson (Eds.), *Handbook of distance education.* (pp 129–144) Mahwah, NJ: Lawrence Erlbaum Associates.

Becker, H. J., & Riel, M. M. (2000). *Teacher professional engagement and constructivist-compatible computer use*. Irvine, CA: Centre for Research on Information Technology and Organizations.

Borko, H., Michalec, P., Timmons, M., & Siddle, J. (1997). Student teaching portfolios: a tool for promoting reflective practice. *Journal of Teacher Education*, 48, 345–357.

Dewey, J. (1900). *The school and society*. Chicago, IL: University of Chicago Press.

Dewey, J. (1933). *How we think a restatement of the relation of reflective thinking to the educative process*. New York: Heath and Company.

Goodyear, P., Jones, C., Asensio, M., Hodgson, V., & Steeples, C. (2005). Networked learning in higher education: students’ expectations and experiences. *Higher Education*, 50, 473–508.

LaBoskey, V.K. (1994). *Development of reflective practice: A study of preservice teachers*. Beverly Hills, CA: Sage Publications.

Loughran, J., & Russell, T. (1997). Meeting student teachers on their own terms: Experience proceeds understanding. In V. Richardson (Ed.), *Constructivist teacher education: Building a world of new understandings.* (pp. 164–181). London: Falmer Press.

Posner, G. J. (1996). Field experience: A guide to reflective teaching. (4th ed.). White Plains, NY: Longman.

Ploetzner, R., Dillenbourg, P., Preier, D., & Traum, D. (1999). Learning by explaining to oneself and others. In P. Dillenbourge (Ed.) *Collaborative learning: cognitive and computational approaches.* (pp 103–121) New York: Pergamon Press.

Schön, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions.* San Francisco: Jossey-Bass.

Schön, D. A. (1990). *Educating the reflective practitioner*. San Francisco: Jossey-Bass.

Sims, R., Dobbs, G., & Hand, T. (2002). Enhancing quality in online learning: scaffolding planning and design through proactive evaluation. *Distance Education*, 23(2), 135–148.

Ullman, A., Peters, D., & Reimann, P. (2005). Developing a research supportive web-based learning system. CoCo Research Centre, The University of Sydney.

Zeichner, K. M., & Liston, D. P. (1996). *Reflective teaching: An introduction.* NJ: Lawrence Erlbaum & Associates.

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Online facilitation: Strategies for gaining engagement in different OLEs

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The strategies that some teachers use in online learning environments engage students, facilitate participation and, more importantly, promote interaction with content, teacher and peers. Following a detailed analysis of the contributions to a sample of online groups, and interviews with the teachers, we report on the strategies that led to the highest contribution rates. This paper focuses on two cases that achieved high contribution rates using two different software packages. We provide an analysis of the tasks set by teachers, class activity, the frequency of postings, the value of the software features and the overall structuring of online processes. While we could not identify clear impacts of the different interfaces on the contribution rates achieved, we do canvass some possibilities in this area.

Keywords: online, pedagogy, learning, environment, interaction, analysis

Introduction

Although many studies have been carried out to examine online interaction within learning systems (Holmes, 2005; McKenzie et al, 2000; Henri, 1991; Mowrer, 1996; Gunawardena et al, 1997; McDonald et al, 1998; Angeli et al, 1998; Newman et al, 1995; Kanuka et al, 1998; Garrison et al, 2001; Pawan et al, 2003) few have specifically addressed how the software and its features affect the learning and teaching process. We initially set out to explore this issue by comparing the quantitative and qualitative character of the contributions made to classes using two different systems to support asynchronous communication.

The two systems differed significantly in their support for asynchronous communication. WebCT(CE) used a standard newsgroup interface for group communications but lacked any specific structural support for teaching strategies. WebTeach provided explicit structural support for pedagogic interaction using a range of strategies, including discussion, brainstorming, case studies, questioning, debates, commitment activities, quizzes and task-setting. It also offered participants a 'meta-comment' facility whereby they could make a contribution intended as an aside, or as a query or comment on the current task or process. These meta-comments were displayed in a different font and colour and were indented in the transcript. The teacher in one of the cases reported below used this facility extensively.

Both systems notified participants of group activity by a summary email, sent to their private email address. The WebCT summary listed affected groups only, while the WebTeach summary was more informative as it included the titles of the threads contributed to, in addition to the group titles.

Apart from the above differences, the most significant difference between these systems from a user perspective was the interface: WebCT organised learner and facilitator postings through nested 'threads' or topics, allowing out-of-chronological-order postings; while WebTeach provided a continuous and strictly chronological transcript of each online activity.

The style of the WebCT communications interface should be familiar to most readers, even if the specifics are not:

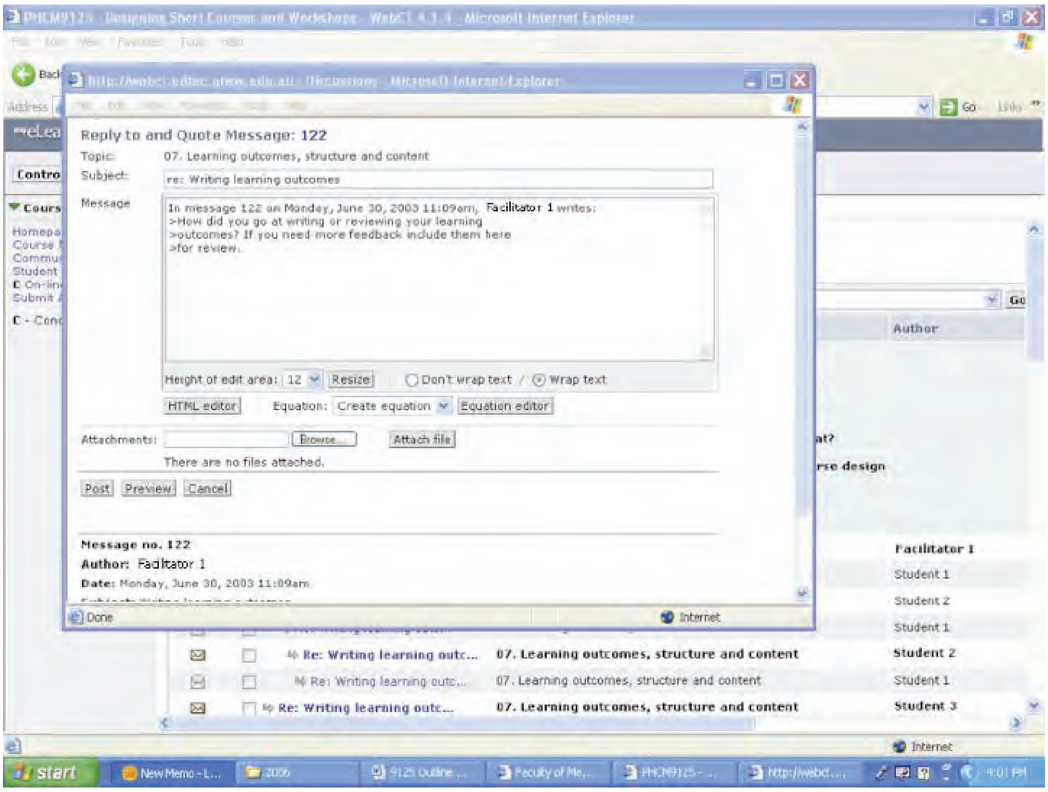

Figure 1: The WebCT CE communications interface, showing threaded discussion and the contribution window

But the interface of the WebTeach environment may be less familiar:

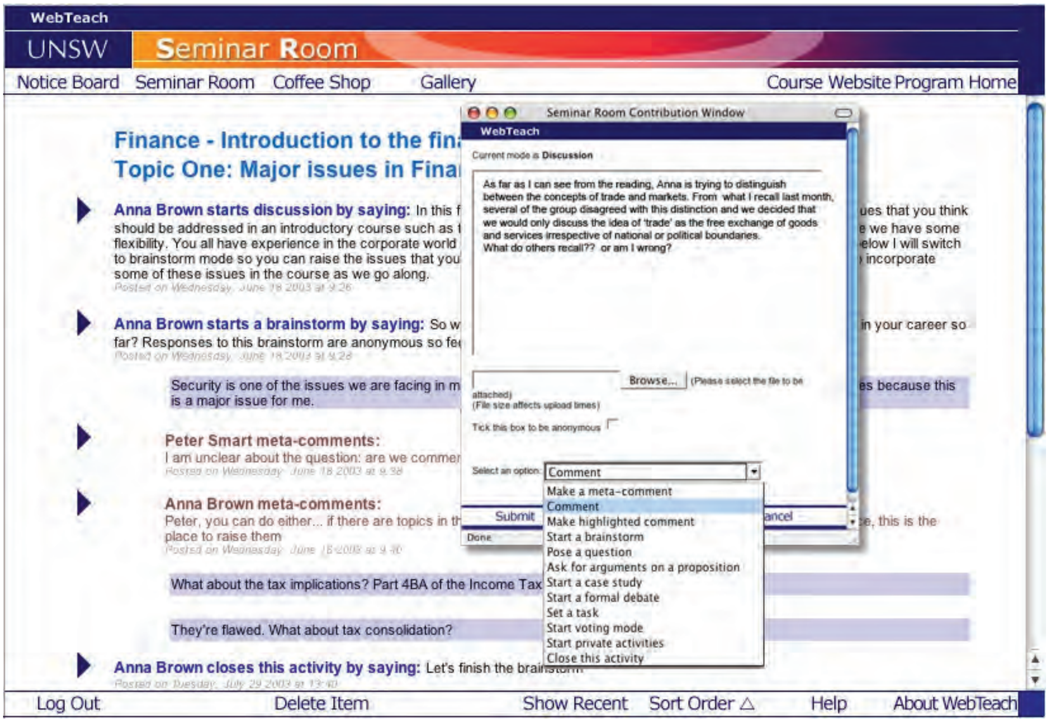

Figure 2: The WebTeach communications interface, showing the chronological and structured presentation of contributions and the contribution window

Our original research questions sought indicators of deep learning processes and how the contributions of learners and facilitators could be characterised. Ultimately, we sought to identify the impact, if any, of the features of the two software systems on the educational processes they supported.

Background study

Our initial study obtained ethics approval for an opt-out consent process that eventually gave us access to 17 fully online classes, 15 of which were assessable postgraduate classes, and two that used WebCT for faculty development purposes only. The classes were not randomly selected. Firstly we sought permission to view the transcripts of only those classes that had had instructional design support in their development and ongoing facilitator support for their delivery. We did this in the hope of maximising the quality of the pedagogic designs of the classes included in the sample. We then only had access to those classes for which both the teacher and all the students gave consent. In the end all but two of the classes in the sample had the benefit of instructional designer support. Two of the classes using WebTeach were unsupported.

Following a search through the literature for a coding approach by which we could identify indications of deep learning and engagement, we adopted a broad scheme, based largely on the work of Salmon (1999) and involving three categories:

- ***Individual*** – in which a participant initiates a new topic; articulates, explains or justifies a position; give examples and reflects.
- ***Interactive*** – in which a participant expands the ideas of others; critiques, discusses, negotiates or summarises previous material, proposes actions and shares resources (Salmon, 1999; Paulsen, 1995; Gunawardena et al., 1997; Cutler, 1995).
- ***Affirming/social*** – for affirming others, maintaining phatic processes, making metacomments, group management contributions, or for off-the-point comments (Salmon, 1999; Hughes & Hewson, 2005).

The coding scheme that we adopted identified a 'posting' as the fundamental unit of online interaction and classified the communicative purpose of each contribution according to one or more of the categories above. Each posting was evaluated and coded using percentages split three ways; indicating the proportion of the posting that was considered to fall into each category, with the sum equalling 100%. Sample classes were dual-coded in an attempt to demonstrate reliability in the coding, but despite a range of simplifications and refinements, acceptable reliability levels proved elusive. This experience accords with the general tenor of the literature in this area (Rourke, Anderson et al, 2001).

Although the attempt to code the contributions to the system failed to achieve acceptable reliability levels, the project yielded a considerable amount of objective data, and this revealed a differential in contribution rates between the two systems. The relevant statistics from the dataset involving over 5000 contributions to 176 teaching activities in the 15 fully online and assessable postgraduate classes are shown in Table 1.

Table 1: Comparative statistics overall

Characteristic	WebCT CE	WebTeach
Number of classes in sample	7	8
Average number of students per class	45	20.9
Average number of teaching activities per class	5.6	15.6
No. of contributions analysed	1025	3181
- % teacher	13%	24%
- % student	87%	76%
- % that name someone	46%	34%
Mean number of contributions per class	146.4 (SD = 120.8)	397.6 (SD = 350.7)
Maximum contribution rate (posts / participant)	5.7	42.6
Mean contribution rate (posts / participant)	3.15 (SD = 1.71)	16.71 (SD = 12.73)
Median contribution rate (posts / participant)	2.98	16.06
Intensity of contributions (posts / total topic days)	0.59	1.12

We can summarise this dataset by saying that the teachers using WebTeach were teaching somewhat smaller classes, and were using on average three times as many teaching activities than the teachers using WebCT. A teaching activity is defined here as a distinct thread in which the teacher sets a task for the students to respond to. The teachers using WebTeach were also more active in their classes, contributing 24% as opposed to 13% of the contributions. But the standout difference was the contribution rate data. Teachers using the WebTeach software seemed to achieve contribution rates, however defined, that were up to five times the rates achieved in WebCT.

Given the failure to achieve reliability in the attempt to code the character of the individual contributions we decided to explore the contribution rates issue by using a case study approach. The two different learning systems offered different tools, and accordingly, we reasoned, the facilitators might also approach their teaching in somewhat different ways.

Accordingly this report is focused on our analysis of just two fully online groups. We selected the two groups that exhibited the highest contribution rates as the focus. The WebCT group with the highest rate was one of the non-assessable faculty development groups in the original sample. It was not included in the data reported above. The highest contribution rate achieved in a formal award class using WebCT in the dataset was 5.7. We considered this to be too low to represent a worthwhile case through which to explore how high contribution rates are achieved. Hence the adoption of the faculty development case as the WebCT focus. The WebTeach group was included in the data reported in Table 1, as it was a formal award class, fully online and assessable. Firstly, we will report on the quantitative data for each group and then use facilitator interview data to compare and contrast the processes employed in the teaching process.

The results of our analysis of the quantitative data for the two cases are presented in Table 2.

Table 2: Comparative statistics for two cases with high contribution rates

Characteristic	**WebCT - Campus Edition**	**WebTeach**
Group focus	**Online learning**	**Business Technology**
Period of activity	12 weeks	12 weeks
Number of discrete topics/activities	27	28
Number of ‘students’	26	24
No. of postings/contributions	619	1085
- % teacher	23%	29%
- % ‘student’	77%	69%
No. of ‘student’ postings	477	749
Posts per ‘student’ (excluding teacher posts)	18	31
Overall contribution rate (posts / participant)	23	43
% all posts that name someone	17.0%	45.7%
Course intensity (posts/course day)	7.4	12.91
Intensity (posts/total topic days)	1.63	1.66

Firstly, it is noteworthy that these two groups are comparable in many ways, with identical durations, and similar numbers of teaching activities and students. The teacher contribution rates are also similar. When compared to the overall dataset reported in Table 1 however, it appears that both groups are outliers on several indicators. The group sizes are at the smaller end of the overall range, and are particularly small when compared to the WebCT classes in the overall set (26 as opposed to 45). The number of teaching activities used is higher than the average for both systems, five times higher for the WebCT case, and almost twice as high in the WebTeach case. The teacher contribution rates are higher than the average too, and again much higher (23%) than the WebCT average in the overall set (13%).

The naming rate, a possible indicator of phatic engagement, is much higher than the average in the WebTeach case, and much lower than the average in the WebCT case. We have tentative explanations for these results, discussed below, but note only that care must be exercised when interpreting the naming rate indicator. The WebCT interface effectively asked for a name since a contribution was made in that environment in direct response to another, as though the contributor was addressing the author of the chosen message. In WebTeach contributions were made more to the group as a whole and to all the current participants, rather than to any one individual. It was not possible to respond to any single contribution directly in this interface. Hence the use of names in the WebTeach environment was a way of indicating the target of your comment, as well as a way of affirming another contributor. Thus the different rates found in the two environments arise from quite different underlying contributor behaviours.

Given the overall similarity of the groups, the higher level of contributions achieved in the WebTeach group (1085) compared to the WebCT group (619) is noteworthy. Taking into account the teacher contribution rates, there were 477 student contributions to the WebCT group, and 749 contributions to the WebTeach group over the same period. The average number of contributions made by each student in the WebTeach group was 31, whereas the 'students' in the WebCT group made an average of 18 contributions each.

It might be thought that the higher contribution rate achieved in the WebTeach case is due to the fact that it was an assessable award course, where there was an assessable participation requirement, whereas the WebCT course was for faculty development, and was not formally assessed. However, the WebCT course was chosen because it achieved the highest rate of all the WebCT courses in the dataset, whether participation was a requirement or not. Since it achieved contribution rates much higher than the courses that were assessed, it seems reasonable to suggest that this rate was achieved, at least in part, by the teaching approaches adopted. We will explore this issue further in the case studies below.

An analysis of the tasks set in each activity was conducted. Each task was evaluated to identify if it was explicitly collaborative, and if it set a clear definable task. Tasks were categorised as collaborative if they explicitly asked participants to respond to another participant's post. This was usually a straightforward categorisation task, but in some WebTeach modes the collaborative requirement was represented more by the mode employed than by the details of the task set, and this may not be captured in the analysis below. We comment on this further in the WebTeach case study. An example of a collaborative task was:

> Post your thoughts on the readings, and your responses to those of others, up into the discussion…

Additionally, the tasks set were categorised as either 'clear' or unclear'. A clear task was explicit with defined requirements. An example of a clear task was:

> What project management framework do you use in your organization? Does it follow a model?

An unclear task, on the other hand, was:

> Use this thread to discuss any issues that arise…

On analysis 5 of the 27 tasks in the WebCT group explicitly asked for collaboration, and 25 of the 27 were categorised as clear. In the WebTeach group, only 2 tasks were explicitly collaborative (but the number could rise if the impact of the inbuilt structures is taken into account), and 27 of the 28 were categorised as clear.

In order to gain a better understanding of the teaching approaches used in these two cases, we conducted semi-structured interviews with the two teachers involved to explore issues such as tasks set, level of class activity, approaches to managing the groups, facilitator engagement and the impact of the software features on the overall structuring of online processes. We report on the main issues that arose below.

Faculty development group on online learning using WebCT

This course was designed for academic staff at the university who would be using a digital environment in their teaching. The focus was on immersing the participants in the digital environment in order for them to take on new ways of interacting, behaving, constructing identity, using texts and learning and teaching online.

The teacher designed and taught the course fully online as a pilot in what has now become a course in a postgraduate certificate program. It was designed to apply a critical approach to the new learning spaces enabled by internet technologies, conducting collaborative work and discursive exchange across a range of modes and media including weblogs, wikis, discussion boards and chat rooms. The discussion board was set up to include weekly tasks using the discussions tool of WebCT. For some tasks students were assigned to a group. Many of the tasks focussed on handling real examples taken from other online courses to address issues around online learning and teaching as well as discussion around current literature. Reflection was also a large part of the course with the use of individual weblogs.

The design of the WebCT environment was based on structured activities, as the teacher explained:

> I wanted it to be flexible as the distance mode is and I also wanted it to be structured enough that there was a sense of purpose to the work people were doing so it was that really awkward kind of balance between getting a critical mass every week doing the same thing and introducing a certain element of rigidity into the course structure, so the way I did it was to have a week by week activity so that every week there was a separate activity.

The teacher also commented that the design of the structured activities was a deliberate attempt to engage the students and encourage a high level of interaction. If participants did not take part in the online discussions then they were really not taking part in the course. She noted:

> They were a very lively and precocious group but they were very busy as well, they were all teachers or support staff here and madly busy, particularly the academic staff so they were really fitting this in so the course had to motivate them to take part or they would have just let it fall – so the case study activity worked really well because it was very fragmented so it was quite easy to engage with and quite interesting to discuss.

Describing her role in the online environment, the teacher explained:

> The most ‘teacherly’ thing I did in that course, apart from designing it and building it, was to summarise I think, that was the biggest teaching task for me in the discussion forum, at the end of every week I’d spend a good hour or two constructing a summary of what had happened that week and people really valued that and it was quite time consuming but it was valued so that was an important role as a kind of meta commentator if you like.

The teacher varied the groups, explaining she wanted participants to experience different modes of group work online so sometimes she set up an all group discussion, sometimes it was small groups, sometimes it was bigger groups. When asked how the learners were managed, the teacher stated:

> We didn’t do any nomination of leaders in that course, although leaders did emerge. Initially we split the group into two… and then for smaller groups we split those in two again … originally I was going to build in ‘this week you must nominate someone to’ or nominate a summariser but I ended up not doing that in the asynchronous discussion board because each activity was only a week it would have taken too long to negotiate that – we did it in the synchronous discussions.

When reviewing the course the teacher commented:

> In the evaluation of the first one some people said the structure was too rigid and that they wanted more time to go back to activities and this time I’m structuring it in blocks and each block is maybe 2 or 3 weeks – within each block there will be maybe 2 activities running concurrently so people will have a bit more flexibility and a bit more time so we’ll see how that works, it will be interesting to see if it is not enough structure.

Few of the tasks in this group were categorised as collaborative, and this may in some way explain the relatively low naming rate exhibited in this group. Since the tasks set were almost all categorised as clear, it may be that the participants felt that they were responding to the explicit demands of the task rather than to any particular posting by another, and this may have led to the lower than average naming rate.

Postgraduate course in business technology using WebTeach

This wholly online group was from a course within a Masters of Business and Technology. The overall approach taken by the facilitator of this group was to have a series of terminating tasks prepared in advance, along with a schedule for their deployment. Some tasks addressed the whole group (such as ice-breakers and brainstorming) while others were set for small groups of 4-5 using the 'private activity' feature of WebTeach. These small groups later reported back to the larger class to share the outcomes of their activity. In this way the facilitator kept quite tightly structured activity going throughout the course rather than initiating open-ended discussions with no clear end point.

> I try to start a few activities quickly in the beginning to build a sense of urgency. It is not easy to get students to interact. One of the techniques I use is to have a discussion on a study topic while at the same time I post a general topic. This is to divert the frequent posters to a more interesting place while the occasional posters can take the courage to chip in. I also state in my expectations at the beginning that shorter more frequent posts are better.

One significant feature of this group was the level and timing of facilitator intervention. The data revealed a high level of teacher contributions when compared to other classes analysed, but also that the teacher reacted quickly to learners' postings in the early stages of an activity. The facilitator explained:

> In an on-line class you have to guess how the student is feeling when he/she is responding to a question asked by you. You need to be intuitive and if you feel that the student is under stress you need to change your tone. … I think it is important to acknowledge each person's contribution wherever it is possible to give the class a personal touch. I always try to be proactive in the beginning to promptly acknowledge contributions to get students motivated with their names. In fact this is an advantage in an on-line class as sometimes you cannot remember the names of the students in a face-to-face class.

This comment also raised the issue of naming, in which a contributor (facilitator or learner) using the WebTeach software uses names when responding to the contribution of a specific individual rather than to the group in general. The naming rates in this class were unusually high (even for users of this software) and usually occurred as part of an affirming/social posting. This may be in part because of the deliberate use of names by the facilitator, both to address comments and questions to individuals and to affirm the contributions made in response. This also highlights the facilitator's active approach in maintaining an overview of the learning process while initiating tasks and offering content within them. When asked to explain his interventions, the teacher replied:

> Metacomments are useful to hover around the class and chip in a comment here and there to get things moving … like supplying grease to lubricate the wheels. They are particularly useful in group work, when you are mentoring them or offering suggestions to improve their process.

This facilitator had made extensive use of the pre-structured teaching 'modes' offered by the WebTeach system. He employed the brainstorming, private discussions and debate structures at specific points during the course. This created a class dynamic that mirrored face-to-face classroom practice, but which is usually not attempted online. The facilitator reported:

> I like to use a variety of activities and sometimes in a sequence to get the class involved. For example I may start with brainstorming and break up into a discussion based on the brainstorming outputs. While having a seminar discussion I may turn on the argument mode to get learners engaged in taking a stand and arguing their position. I also teach a class at my university where such facilities are not offered. I have tried to create these activities with the facilities in [another system] but it is not so effective.

Again the use of the structured modes in this group may have led to the higher than average naming rates identified. The argument mode in particular asks students to respond explicitly to the contributions of others. While this collaborative aspect of the task may not be identified from the topic set, it is implicit in the way the software structures this mode: it seeks arguments for and against a proposition and as the arguments are displayed, the tendency is to respond to arguments already contributed, and to do so, within this interface design, the contributor has to name the person to whom they are responding. On the other hand, the brainstorming mode referred to by the teacher enforces anonymity. In this mode the names of contributors are not displayed and cannot be used by respondents.

Finally, with regard to the use of heavily structured activity, this facilitator suggested that different subject areas and different levels of study lend themselves to quite different online strategies. The postgraduate audience for this class suggests that more open discussion might be appropriate, however:

> The possibilities are less in a project management class as the subject is quite focused. I feel that some courses lend themselves more to discussions than others.

Discussion

A number of issues arise from these two case studies that help to characterise the strategies used by these teachers to encourage high levels of participation. Both teachers set above average numbers of tasks for their participants to address, almost all tasks were clear tasks with explicit requirements, and the tasks were scheduled with clear deadlines, usually weekly.

Setting clear tasks with defined deadlines may have contributed to the high contribution rates. In discussions in which there is no clear task, each learner waits till others have contributed some content on the topic before attempting to build on or debate that content. This second, interactive phase of activity affords more opportunities for deep learning and the clarification of conceptions for both the facilitator and other learners. But the elapsed time between participants' subsequent postings may lead to disengagement and loss of the group dynamic. By setting specific expectations and then intervening quickly to encourage and affirm, the facilitator may more quickly guide the dialogue into mutual understanding or critique.

In both cases the level of teacher involvement was relatively high and both teachers felt that they spent a lot of time on facilitation tasks. In the WebTeach case the teacher actively acknowledged contributions and encouraged further postings, deliberately addressing participants by name. It may well be that the WebCT teacher contributed in a similar manner, but she explicitly mentions providing weekly summaries for each activity. Relatively few tasks in either group required students to collaborate, in the sense of building on another's contribution, in their responses.

Both teachers were aware of the busy lives that their participants led and explicitly sought short responses to tasks. The WebCT teacher acknowledges the difficulty of gaining and holding her participants' attention and set deliberately 'fragmented and interesting' tasks to encourage participation. The WebTeach teacher was explicit in his expectation of shorter and more frequent postings.

The WebTeach teacher deliberately ran simultaneous parallel activities in his group in order to allow frequent contributors a place to post without overwhelming or deterring the less confident contributor. Both teachers set specific early tasks designed to encourage early participation. In the WebCT group the teacher scheduled one major activity each week, but both teachers employed split groups working in different threads at specific times. When split groups were used, the teachers either nominated students into these groups to save time, or, in the case of the WebCT teacher, used a synchronous chat session in order to quickly divide the class into groups.

Both teachers employed structured activities (Salmon, 2002) as a means of encouraging participation. For the WebCT teacher this meant setting a clear task each week, sometimes involving a small group to large group process, and in the case of her proposed revision, two parallel tasks running over a longer timeframe. She was using other communication channels simultaneously (blogs, wikis, synchronous chat) but not within the communication area of WebCT itself. The WebTeach teacher used parallel activities, some within the weekly time frame, some for longer. Additionally the WebTeach teacher employed the structured modes of communication available to enhance participation, including discussion, brainstorming, argumentation and meta-comments. Interestingly, the WebTeach teacher had had experience of WebCT and had found it more difficult to set up structured teaching processes using that interface. While some of the structured teaching modes embedded in the WebTeach software can be replicated in the WebCT environment, to do so the teacher not only needs to have these explicit strategies in mind, but also the technical ability to set up the structural support in the newsgroup discussion interface of WebCT.

While both teachers speak of preparing their teaching approaches in advance, there is a greater sense of spontaneity in the WebTeach teacher's comments, whereas the WebCT teacher has built her course and her main activity involves implementing it and summarising the weekly contributions:

> For example I may start with brainstorming and break up into a discussion based on the brainstorming outputs. While having a seminar discussion I may turn on the argument mode to get learners engaged in taking a stand and arguing their position.
> (WebTeach teacher)
>
> The most 'teacherly' thing I did in that course, apart from designing it and building it, was to summarise I think, that was the biggest teaching task for me in the discussion forum, at the end of every week I'd spend a good hour or two constructing a summary of what had happened that week and people really valued that and it was quite time consuming but it was valued so that was an important role as a kind of meta commentator if you like.
> (WebCT teacher)

From the interview it is clear that the WebCT teacher was using additional tools to encourage participation in the class as a whole, including individual blogs, wikis and synchronous chat. This approach, where the contributions are sought using different tools and sites, might explain the lower response rate within the WebCT communications area achieved in her group. However when the elasticity of response that the overall dataset presented is taken into account – with individual rates varying considerably – it seems unlikely that 'response rate' is a zero sum game in which contributing to an individual blog, for example, means contributing less to the official communications area. Indeed it is equally likely that an approach that is successful in achieving high response rates would encourage higher levels of individual responses in all the tools that the participants feel are relevant and appropriate. From the interview it seems that the WebTeach teacher did not use additional tools as part of his teaching approach, although he may have used email to address individual students confidentially.

Returning to the overall dataset presented in Table 1 we note that the WebCT classes tended to employ fewer teaching activities in their designs, and to feature lower teacher contribution levels. From the discussion of the two case studies we may surmise that these factors were partly responsible for the lower contribution rates achieved. But the question remains – why did these teachers, and their instructional design supporters, employ fewer structured tasks, and why did the teachers contribute at a reduced rate to their classes? We have no definitive answer to these questions, except to say that it was more difficult to set up structured processes in the WebCT interface, whereas the WebTeach interface was built to facilitate them. Additionally Thomas (2002) has concluded that the incoherent presentation format that was a feature of the WebCT interface results in many contributions being unread and an increasing loss of control of the thematic flow of each thread by the teacher. Faced with this situation, it may be that many teachers using WebCT responded by abandoning their attempt to guide and direct the discussion.

Conclusion

The examination of the two cases has allowed us to identify teaching approaches designed to elicit high contribution rates, and arguably, levels of engagement in the teaching process, from students. Significant elements in the approaches identified include high levels of teacher activity, high numbers of structured tasks with clear and often tight deadlines, attention to phatic aspects (acknowledging and affirming contributions, using names), an explicit expectation of short and frequent contributions, and regular summaries. These features broadly accord with the recommendations in the literature (Salmon, 2000; Salmon, 2002).

Given these features, it seems reasonable to assume that the higher contribution rates achieved in the WebTeach group arise potentially from a number of factors, including the assessable requirement for participation, the more informative email notifications, the simultaneous setting of parallel tasks, the more ordered presentation of contributions and activities, and the use of the structured teaching modes available. Of course we cannot rule out the contribution of individual factors such as the teacher's personality and online presence, the relevance of the content focus to the participants, and the person characteristics of individual participants. Further research would be needed to clarify the contributions made by each factor listed.

While the facilitator's own expectations and subsequent level of activity and control contribute to the tenor of the contributions and levels of interactivity in an online group, the interface provided by the online environment may also influence group behaviour, and possibly learning. If the goal is to have learners engage more deeply with content and each other, then facilitators who can promote second and third rounds of dialogue and engage many, if not all, of the group in these rounds, should be more successful. We have taken the contribution rate as an indicator of this engagement. If this is accepted then the above case studies suggest that wider engagement and additional levels of dialogue can be achieved by setting and structuring specific activities with defined limits and duration, but also through the management of the phatic aspects of the group process. Recognising early contributions, affirming critical responses and providing well-timed summaries of progress all help to engage learners.

The open structures and tasks often encountered in online classes may lead to acceptable learning, but this is likely to be achieved more slowly and with less student input and interaction. The more intense model of activity evidenced by the above cases studies clearly makes more demands on both facilitator and learners, but promotes higher levels of engagement and interaction.

Therefore, while it is not possible to say that the WebTeach interface alone contributed to the higher contribution rates achieved in the reported case, or in the overall data set, we are able to canvass some of the possibilities here. The interfaces provided by the two systems studied differ significantly and suggest different metaphors for group communication.

The WebCT metaphor, however used, is of parallel and one-to-one communication in which several contributions to a thread are extant and of equal status, and contributors may respond to any contribution within the tree. The result, in terms of the chronology of the process, is incoherent (Thomas, 2002) This interface requires each member to follow the tree of contributions within each thread, and then to synthesise them in order to reconstruct the chronological and semantic process that was followed.

The WebTeach metaphor, on the other hand, is one of a continuing class in which activities are presented chronologically in what is fundamentally a group or one-to-all model of the educational process. It employs a blog structure in which formal activities in the class are part of the 'teacher's blog', and within each activity, structures are available to guide and challenge contributors. The WebTeach interface reflects both the educational and social function of each posting, and its place within the overall process, by using clear visual cues to identify the sequence of contributions, the modes in use, and the roles of the contributors. This is intended to be useful in heavily structured complex processes where it is important to support participation and navigation.

It is tempting to suggest that the contribution rates achieved in the WebTeach groups arise from the more organised and transparent presentation style, which perhaps facilitated the use of parallel activities without causing confusion, and from the availability of the structured teaching modes, but it is not possible to draw this conclusion from the data presented in this paper.

References

Angeli, C., Bonk, Curtis J., and Hara, Noriko (1998). Content analysis of online discussion in an applied educational psychology course.. *Instructional Science,* 28(2), 115–152.

Cutler, R. (1995). Distributed presence and community in Cyberspace. *Interpersonal Computing and Technology: An Electronic Journal for the 21st Century*, 3(2), 12–32.

Garrison, R., Anderson, T., Archer, W. (2001). Critical thinking, Cognitive Presence, and Computer Conferencing in Distance Education. *American Journal of Distance Education*, 15(1), 1–24.

Gunawardena, C. N., Lowe, C , Anderson, T (1997). Analysis of a global on-line debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research*, 17(4), 397–431.

Henri, F. (1991). Computer conferencing and content analysis. In A. Kaye (Ed.), *Collaborative learning through computer conferencing: The Najadeen papers*. (Springer-Verlag, London), 117–136.

Hewson, L., & Hughes, C. (2005). Social processes and pedagogy in online learning. *American Association for Computer Education Journal*, 13(2), 99–125.

Holmes, K. (2005) Analysis of Asynchronous Online Discussion using the SOLO Taxonomy. *Australian Journal of Educational & Developmental Psychology* Vol 5, 117–127.

Kagan, S. (1992). Cooperative learning. San Juan Capistrano, CA: Resources for Teachers, Inc.

Kanuka, H. &. Andersen, T. (1998). Online social interchange, discord and knowledge construction. *Journal of Distance Education* 13(1), 57–74.

McDonald, J., & Gibson, C. C. (1998). Interpersonal dynamics and group development in computer conferencing. *The American Journal of Distance Education* 12(1), 7–25.

McKenzie, W. &. Murphy. D. (2000). I hope this goes somewhere: Evaluation of an online discussion group. *Australian Journal of Educational Technology*, 16(3), 239–257.

Mowrer, D. E. (1996). A content analysis of student/instructor communication via computer conferencing. *Higher Education*, 32, 217–241.

Newman, D., Webb, B and Cochrane, C. (1995). A content analysis method to measure critical thinking in face-to-face and computer supported group learning. *Interpersonal Computing and Technology,* 3(2), 56–77.

Paulsen, M. F. (1995*). The Online Report on Pedagogical Techniques for Computer-Mediated Communication,* Available online at: http://www.hs.nki.no/morten/cmcped.htm (accessed 15 May 2006).

Pawan, F., Paulus, T., Yalcin, S.,Chang, C. (2003). Online learning: Patterns of engagement and interaction among in-service teachers. *Language Learning & Technology*, 7(3), 119–140.

Rourke, L., Anderson, T., Garrison, D. R. & Archer, W. (2001). Methodological issues in the content analysis of computer conference transcripts. *International Journal of Artificial Intelligence in Education*, 12, 8–22.

Salmon, G. (1999) Reclaiming the Territory for the Natives, Online Learning: Exploiting technology for training, London, Nov. 23 & 24, 1999. Available online at: http://www.emoderators.com/moderators/gilly/london99.html (accessed 19 May 2006)

Salmon, G. (2000) E-Moderating: *The Key to Teaching and Learning Online.* London, Kogan Page.

Salmon, G. (2002). *E-tivities: the key to active only learning*. Sterling, VA : Stylus Publishing Inc.

Thomas, M. J. W. (2002) Learning within incoherent structures: the space of online discussion forums. *Journal of Computer Assisted Learning*, 18, 351–366.

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Analysing the efficacy of blended learning using Technology Enhanced Learning (TEL) and m-learning delivery technologies

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The developing ubiquitous nature of information communication technology (ICT) offers opportunities and benefits in the educational field when blended with more traditional approaches to learning and teaching, they include: monitoring of on-line activity, rich administrative support, repository of learning materials, multiplicity of assessment options and strong collaborative tools. Additionally, it is common for third level students to have excellent internet access on campus, in university residences, and at home. This technological strength coupled with the high level of ICT literacy of today's student makes blended learning an attractive option. In order to obtain maximum benefit from such a blended approach students must log-on to the learning environment regularly to see new information and maintain their collaboration, a discipline they do not easily adopt. Two ways of encouraging such engagement, the first of which is tested in this paper, are technology enhanced learning notification methods and m-learning announcement means. The TEL notification method is discussed and tested through a student survey (COLLES) to determine the students' perception and preference.

Keywords: learning environment, blended learning, m-learning, technology enhanced learning, COLLES, learning management system.

Introduction

Learning environments can strongly influence student outcomes and play an important role in improving the effectiveness of learning. However, there is a plethora of learning environments available at present, from freeware (open source) (ComputerScope, 2004) to proprietary models. This research is not focused on choosing an appropriate learning management system for the teacher and their students; rather, it is focused on exploring the best delivery notification means that can be implemented for the systems users. This paper will use an open source learning management system called moodle (Moodle, 2001) as its test-bed. The first stage will focus on technology enhanced learning as the delivery medium in conjunction with the learning environment. The second stage will function with m-learning as the delivery medium in union with the learning environment.

Each stage is followed up with a Constructivist On-Line Learning Environment Survey (COLLES) in which the class submits feedback on the new learning experiences obtained over the term. The use of the local area network within the university offers academics a simpler, more streamlined method for the protection and collection of the data (Mertler, 2003). The learning environment analyses the data and provides instantaneous feedback with graphical representations depicting each of the sections within the survey (Dougiamas & Taylor, 2002).

This paper is a work in progress. It centres on the student viewpoint based on a technology enhanced learning approach and their perceptions of this sole delivery method. 16 students completed the survey and the results are discussed later in the paper.

Learning environments and blended learning

Learning environments, with a blended learning approach towards teaching, is supporting more and more courses nowadays (Jonassen, 1999). With respect to this paper and research, blended learning is using online resources such as learning content, assignments, collaboration tools and assessment features in parallel with the more traditional face-to-face means of lecturing. Course content was covered in the classroom with the students face-to-face and the learning environment was used to refresh the material in the form of quizzes, assessments and projects. This permitted the students to gain a deeper understanding of the knowledge being imparted to them(McHugo & Hall, under review). Blended learning has the best of both worlds in terms of conventional teaching methods and an e-learning system. Conventional teaching shortfalls can include the students being tied to a rigid timetable, time restraints on access to the laboratory and equipment and being dependant on tutors for problem solutions. These points can all have negative impact on a student's problem solving skills.

Blended learning and the associated learning environment provides an informal environment for students to study and learn in. Material is made available and accessible to all students regardless of their location and time zone. There are no time constraints on viewing said material and exercises and lab work can be started, saved and continued until a satisfactory outcome is reached. Discussion forums and other collaborative features exist to support the students in their learning, whether it is from the tutor himself or the other engaging students within the class(McHugo & Hall, under review).

Constructivist on-line learning environment survey (COLLES)

The COLLES was designed to help assess the extent to which web teaching enriches distance or online student's ways of knowing. The survey has the potential to generates a measure of a student's perception of both their preferred and actual on-line classroom environment (Taylor & Maor, 1999). COLLES was developed from its three-scale predecessor, the Constructivist Virtual Learning Environment Survey (CVLES) (Taylor & Maor, 1998) to measure questions about the quality of online learning environments from a social constructivist perspective in an effort to ensure that "technological determinism doesn't overshadow sound educational judgement" (Taylor & Maor, 1999) in online or distance education.

There are three options within the survey. These include a preferred form, an actual form or a combined preferred and actual form. The preferred form asks a student about their preferred or ideal experience in an online learning course. The actual form helps the teacher understand how well the online delivery of the material helped the students to learn. The preferred and actual form is a comparison of what they were looking for and what they got and an analysis of the difference, if any, between the two. The responses of the students to any of the forms helps improve how the material is presented to them in the online learning environment. Because the form was administered at the end of the semester the third form – the preferred and actual form – was made accessible to the students. The COLLES scores a five-point Likert-type responsive scale with the score to the left of the value (Table 1).

Table 1: COLLES survey scale

1	2	3	4	5
Almost Never	Seldom	Sometimes	Often	Almost Always

There are six scales to the COLLES:

- *Relevance*: the extent to which engagement in the online classroom is relevant to the student's professional views and related practices.
- *Reflective thinking*: the level at which critical reflective thinking is occurring in association with online peer discussion.
- *Interactivity*: how the communicative interactivity is occurring online between students and between students and teachers.
- *Tutor support*: the degree to which challenges and communicative role modelling is provided by teachers.
- *Peer support*: the magnitude of encouraging support that is being is provided by the teachers.
- *Interpretation*: the point to which students and teachers co-construct meaning in a congruent and connected manner.

Preliminary findings

Initial testing was carried out on a group of 16 students studying a programming language module during the second semester, in the second year, of a four year degree course. The students had access to the learning environment both on and off campus. Laboratory problems and solutions were available online in addition to the learning material. Assignments were set, reviewed and marked based on a given timeline that coincided with the learning material. In class assessments were also administered to the students throughout the semester. Grades were automatically awarded based on the students quiz answers. Presentation skills were also part of the syllabus, utilising the learning environment as a medium through which the students delivered their work to the rest of the class.

Non-response rates to internet surveys could be an issue and could be affected by technical issues such as client software used, choice of internet browser, client operating system and the reliability of Service Providers. However this was not a problem for us. The university has a standard build on all computers on campus. This, in turn, removes the issue of client software, internet browser and operating system. They are the same across the board and tried and tested before the semester starts. The Service Provider is supplying the necessary bandwidth for all the university related internet activity and as much is deemed reliable. Figure 1 shows the class mean scores on six scales for both the preferred and actual forms of the COLLES which were administered towards the end of the 13 week teaching semester.

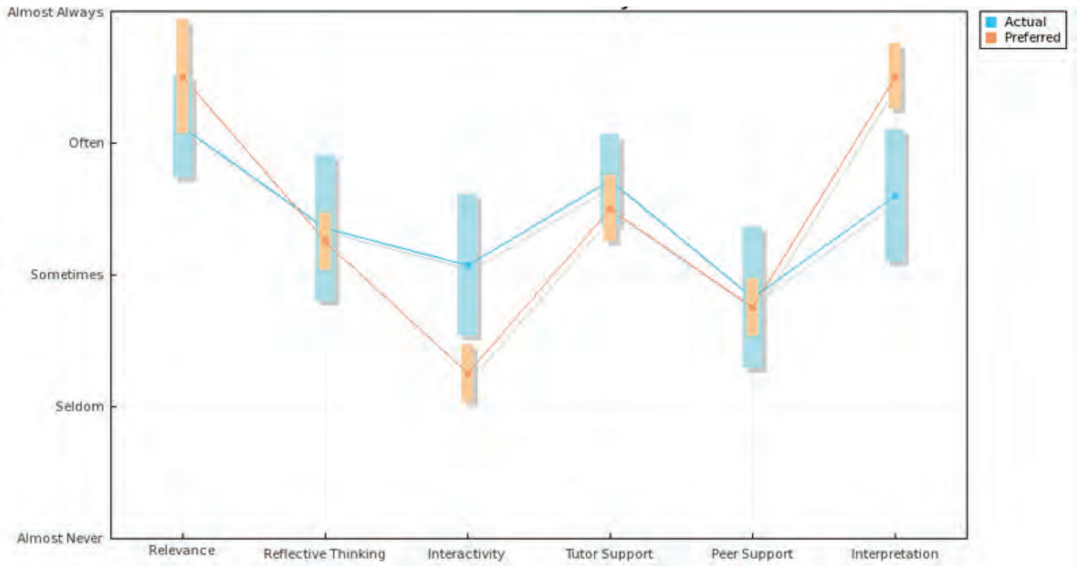

Figure 1: COLLES survey summary

Survey analysis

Students have indicated high expectations towards relevance and interpretation. They expect their online learning almost always to be interesting and directly related to their professional practice (mean = 4.5); and they perceive that this occurs very often (mean = 4.1). Their expectations that they and their fellow students and lecturers very often (mean = 4.4) make good sense of the messages posted are relatively close to being realised in practice (mean = 3.6). This suggests that online (asynchronous) communication is very comprehensible and meaningful.

Students prefer to be engaged sometimes in thinking critically about their ideas and their fellow students' ideas (mean = 3.2). Their expectations of the lecturer towards encouraging, praising and valuing their online support shows that the students are individually co-ordinated and capable or working on their own initiative (mean = 2.7).

In general, students' preference for the online lecturer to frequently (mean = 3.4) provide tutor support are close to being met in practice (mean = 3.6). One might expect that students would value highly the opportunity to interact often with fellow students, a general preference was indicated for this to occur just above seldom (mean = 2.3). Given that students were engaged in online assessments, in-class questions, individual and group assignments, topic changes and presentations, it was somewhat surprising that the class perceived that only sometimes did they have the opportunity to engage in an exchange of ideas with other students (mean = 3.1). As shown in figure 1, there is little variability between preferred and actual expectations from the students on their overall online learning experiences.

Conclusions

Mid way through this research and thus far the findings, based on the survey, are interesting. The students are engaged within the learning environment and within the classroom. The notification method thus far has proved successful based on assignment, assessment and laboratory deadlines throughout the semester. Students have uploaded their material on time or they have been notified of any changes to schedules with the minimum of disruption. The second phase will commence in the fall of 2006 based on m-learning technology. Both classes selected have an engineering background and the topic areas are focused on programming languages in order to keep the findings more relevant.

References

ComputerScope. (2004). Open Source, a popular option, survey reveals. *ComputerScope*, May 1, 14.

Dougiamas, M., & Taylor, P. (2002). *Interpretive analysis of an Internet-based course constructed using a new courseware tool called Moodle*. Paper presented at the 2002 International Conference of the Higher Education Research and Development Society of Australasia (HERDSA), Perth: HERDSA.

Jonassen, D. H. (1999). Designing Constructivist Learning Environments. *Instructional Design Theories and Models: A new paradigm of instructional theory,* 2, 215–240.

McHugo, C., & Hall, T. (under review). *Structuring and Assessing Problem-Based Learning in ICT Education.* Paper presented at the International Association for Development of the Information Society (IADIS) Cognition and Exploratory Learning in Digital Age (CELDA) 2006, Barcelona, Spain.

Mertler, C. A. (2003). Patterns of response and non-response from teachers to traditional and web surveys. *Practical Assessment, Research & Evaluation*, 8(22). http://PAREonline.net/getvn.asp?v=8&n=22 [viewed 27 October 2006].

Moodle. (2001). *Moodle – A Free Open Source Course Management System for Online Learning*. http://moodle.org [viewed 20 June 2006].

Taylor, P., & Maor, D. (2000). *Assessing the efficacy of online teaching with the Constructivist On-Line Learning Environment Survey.* Paper presented at the 9th Annual Teaching Learning Forum – Flexible Futures in Tertiary Teaching., Perth, Curtin University of Technology, Australia. http://lsn.curtin.edu.au/tlf/tlf2000/contents.html

Taylor, P. C., & Maor, D. (1998). *Constructivist Virtual Learning Environment Survey*. http://www.curtin.edu.au/learn/unit/05474/forms/CVLES_form.html [viewed 20 Dec 2005].

Taylor, P. C., & Maor, D. (1999). *The Constructivist On-Line Learning Environment Survey (COLLES)*. http://surveylearning.moodle.com/colles/ [viewed 14 May 2006].

Bionotes

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Towards a reference model for the personal learning environment

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The concept of 'Personal Learning Environment' (PLE) is fast emerging as a significant branch of learning technology. This paper describes the approach to this topic adopted by the Centre for Educational Technology and Interoperability Standards (CETIS) PLE project in the definition of a PLE Reference Model and in building a PLE prototype. In a domain that is typified by emerging technology, discursive differences and a lack of common terms of reference, we explain our approach in identifying three perspectives on the PLE for analysis: themes, patterns and categories. These three strands are viewed as different 'strata' to approach the topic, the interplay between which has led to a perspective on the PLE which has combined an analysis of current PLE-focused discourse (themes), an examination of current practice (patterns) and an attempt to define phenomenological categories of the 'PLE experience' from the philosophy of technology and cybernetics. We introduce our model as the focal point for these different investigations and discuss how the model can help in the effort to coordinate technological and discursive developments that will ensue in this area. We argue that the approach adopted in defining the model has allowed us to produce an effective tool for coordination of discourse and technological design, and that the identification of categories has contributed a powerful element to our analysis – one which may have application in other areas of e-learning.

Keywords: personal learning environment, service oriented architecture, reference model

Introduction

The concept of 'Personal Learning Environment' (PLE) lies behind some important recent technological developments in e-learning. There are currently a number of e-learning software projects with a claim to being PLEs, whilst at the same time there is a diversity of interpretations of what a PLE might look like and do. This too is reflected in the discourse, which by its emergent nature is largely being conducted through blogs. Attwell, for example, sees the PLE as having a significant effect in empowering users of informal learning resources, away from institutions (Attwell, 2006). Alternatively, it can be seen as a way of managing personal goals in the context of personal development planning (Heibert, 2006). In addition to this, the PLE has its detractors, amongst whom Blackall argues that a desktop operating system will suffice for most of the needs of learners, and that specialist tools (be they VLE, PLE, or what) are not required (Blackall, 2005).

Such disagreements and divergences are symptomatic of a lack of clarity in the terms of reference of the PLE, and it is to this lack that the CETIS project has addressed itself. This is seen as an important goal, for despite the differences of opinion, it is clear that significant technological change in the form of 'Web2.0' (O'Reilly, 2005) technologies and service oriented architecture are contributing to significant changes in user behaviour. Within this changing environment, it is reasonable that emerging learning technologies will have to account for these environmental changes, as will the practices and organisational structures employed by educational institutions. However, without clear terms of reference and a definition of the characteristics of the PLE, a coordinated approach to the planning and design of new learning technology cannot take place.

For such a model to be an effective tool for coordination, however, it should be able both to embrace a range of practice and opinion which is at the very least diverse and sometimes contradictory. It is this contradictoriness that forms the essence of our approach. We start by accepting that there are many possible descriptions of a PLE to be made, and not all of these descriptions are compatible with each other. But a diversity of description doesn't necessarily mean that an effective coordination of learning technology in a transformed environment cannot be achieved. The purpose of the project has therefore been to discover ways of achieving a 'coordination of descriptions' of the PLE, and this we have approached through a careful analysis of different strata of description. The strata we have chosen are: an analysis of opinion of what the PLE is, and what it means; an analysis of current patterns of behaviour with technology; and a philosophical analysis of learners' relationships with tools for learning, and their situation within the wider educational system.

The strata of the investigation

The levels of description vary in terms of precision and methodological approach. The first level is highly informal where opinions on matters related to technological change and the critique of current technologies are considered. This is in contrast to a rigorous methodical application of Alexander's (1977) 'Pattern Language' technique. Finally, the deepest level considers an in-depth philosophical analysis of the phenomenology of tools and usage and their relation to learning. Bearing in mind this diversity of description, there is a distinction to be made between agreement between the different descriptions and a 'coordination' between them. With regard to this, a 'coordination' we see as a way of guiding technological action (in terms of strategies and plans for adoption, design recommendations, etc). But such a coordinating framework does not preclude the possibility that disagreements over 'what the technology is' may still exist (and given the 'personal' nature of the technology, are highly likely!).

The discursive themes of the PLE

The most diverse stratum of investigation is that of opinion of current developments in technology and critique of existing learning technology. Nevertheless, it is possible to organise this discourse into particular thematic groups. For example, we have identified a group of themes which reflect a dissatisfaction of current Learning Management Systems (LMS) technology – particularly in the light of a reflection in its ability to deliver the aspirations of e-learning. These criticisms reflect:

1. The difficulty of current institution-based LMS systems in catering for the mobile life-long learner.
2. The difficulty of current institution-based LMS systems in allowing for the learner to organise the material that is presented to them. Currently, this organisation of material is controlled by teachers.
3. The inability of current institution-based LMS systems in extending beyond the domain of the course itself, rather than affording the opportunity for the learner to integrate other elements of their lives into their learning.
4. The inability of current institution-based LMS systems in extending beyond the domain of the course itself, rather than affording the opportunity for the learner to integrate other elements of their lives into their learning.
5. The barrier that is presented to learners in the requirement to find out 'how to use' a particular LMS (which is more of a problem when a mobile learner has to use two different LMS systems at different institutions).
6. The inability of many institution-based LMS systems in affording the opportunity of greater peer-based pedagogy.

Reactions to such criticisms are widespread and not all of them advocate a PLE (for example, the e-portfolio community would argue that their technology meets some of these issues). For those who suggest a PLE as a response, the central argument is that such criticisms arise from the institutional control of technology, and that if the institution divested technology, and learners themselves took responsibility for coordinating their technology, then these issues could be addressed. Related to this is the view that large-scale centralised provision of technology places a heavy burden of administration on the institution – as issues relating to maintaining up-to-date systems, ensuring security, preventing illegal network practices, etc. all take their toll on institutional resources. In this environment, learners find that their home computers not only out-perform institutional machines, but that the freedom of learners to exploit the latest technologies is restricted within institutions on security grounds. Again, the divestment of technology is presented as a solution.

The creation of a 'pattern language'

The second stratum of investigation is more formal involving the use of Alexander's Pattern Language technique for describing the nature of relationships between different aspects of functionality within the information environment. There has been some work conducted both within e-learning and within broader systems design which has used Alexander's technique (Goodyear, 2005; Diaz & Fernandez, 2000). Some of this work maintains a somewhat uncritical adoption of Alexander's ideas, which for those more sceptical of his approach (Dovey, 1990), can detract from the obvious practical benefits of creating a pattern language. Our use of Alexander's technique is pragmatic rather than a whole-hearted embrace of its ontological implications. However, the technique allows us to build up a detailed dimensioned picture of functional affordances of existing technologies. The value of such a picture lies in the fact that if PLE technology is to be effective, then the same functional picture must be reproducible from within the new technology.

To create our pattern language we had to examine a range of technological practices relating to the use of current technologies. These technologies range from chat and email to calendaring, blogging and social networking. The patterns we identified through this analysis ranged from identifying 'context' patterns which involved the setting-up of relationships between communicating parties (implicated in the use of online communication tools), to 'temporal patterns' for the coordination of events and 'workflow' and 'activity management' patterns for the monitoring and coordination of learner activity. These two latter patterns we identified with the provision of current LMS technology. Ultimately we ended up with 8 categories of patterns, with 77 patterns overall.

Having identified patterns, our task was to identify the services which were common across patterns. The objective in this was to be able to reproduce patterns through the provision of an environment of services which the PLE could coordinate. Therefore, having identified the services, a reference model could be constructed which described those services necessary to meet the requirements of current technology usage, but which could be accessed and coordinated in a different way (i.e. through a personal learning environment). However, the association of this service-oriented reorganisation of technology with the ideals of the Personal Learning Environment rested at this stage as an assumption, based in some part on the thinking behind other service-oriented developments in e-learning (for example, the UK Joint Information Systems Committee (JISC) e-Framework (Wilson et al., 2004)). For this assumption to be given greater weight, and the PLE presented as a more significant socio-technical development in e-learning, a deeper examination of the PLE was required.

The philosophical perspective

Dovey's criticism of the 'pattern language' method is (amongst other things) that it attempts to give ontological status to the patterns it identifies. This, it is argued, is mistaken since the patterns are identified within a particular social context and are therefore partially emergent from the social conditions pertaining at the time they were observed (Dovey, 1990). In our pragmatic adoption of Pattern Language, we accept these limitations and whilst it takes nothing away from our pragmatic use of Pattern Language in establishing a comparative benchmark between existing technologies and PLE technology, it necessarily leaves the question of the fundamental nature of the technology open.

The challenge of a deeper perspective is to grasp emergent social and technical processes in a way which is not dependent on prevailing social and technical conditions. To do this, our approach has been to construct models of the social ontology of education, to consider the relationship between these models and the reality that can be observed, and to consider the modelled impact of the PLE intervention. In this we draw particularly on the precedent of the work of Winograd and Flores (1986), Ihde (1979) and Heidegger (1962; 1978) and on the work on social ontology by Bhaskar (1979).

Key to the philosophical thinking is Heidegger's characterisation of a 'tool' as something which specifically presents a physical instrumental component to the user, as well as being something with which *doing* is achieved. The relationship between the instrumental component and the 'doing' is complex: Idhe points out, for example, the semi-transparent role that the instrument of the dentist's probe plays in the dentist's work of examining teeth, whereby the dentist is sometimes made aware of tool, at other times he may not be, focussing directly on the work done with it. What is key in this characterisation is that the 'instrument' matters in terms of the user experience. It would appear that 'knowing how to use' is a combination of ability with an instrument and knowledge of what to do with it.

From the perspective of service-oriented architecture (SOA), this is important because SOA affords a separation between the 'doing' with a tool and its instrument. A web service, for example, may be accessed in many different ways. This separability between service and instrument allows for significant reorganisational change. On the one hand, it allows for the reduction of 'redundancy of functionality' typified by monolithic systems (and e-learning systems), whilst on the other it allows for the possibility that users themselves may be able to define their own instrumentation whilst accessing common services, and in so doing the 'barrier' of having to learn new instruments to access different services can be removed. Furthermore, SOA presents the possibility that not only may not only take ownership of instrumentation, but may be able to rationalise their physical instruments so that they can achieve more with a less extensive range of instrumental practices. It is through this deeper understanding of the implications of SOA that the PLE situates its characterisation as a service-oriented development which performs the function of removing barriers from learners engaged in using tools for learning, and at the same time promoting the reduction of functional redundancy within educational institutions – a process which in turn will serve learners better. It is through this latter process that a deep justification for the divestment of technology may be situated.

The reference model

The PLE reference model brings together the three strata which we examined. The separation of service and instrument is the primary architectural feature of the model. The Personal Learning *Environment* comprises an environment of services which are accessed through a Personal Learning Toolkit (PLT). This toolkit is the piece of coordinating software that the user actually sees – indeed, it might be easy to mistakenly think of this as 'the PLE' – but this is to lose sight of the 'environment' of services upon which the toolkit depends. A particular toolkit may be associated with a particular learner (although there is no reason why a learner should not access a variety of toolkits).

The Personal Learning Toolkit requires the learner to acquire a set of dispositions to use it. Having acquired these dispositions, the learner is free to exploit and organise services. The relationship between the PLT and the services it uses represents the network patterns identified through our 'Pattern Language'. These demonstrate that communication not only happens between the PLT and its services, but between coordinating services and other services, and in addition a single PLT may communicate with other coordinating services. By this mechanism, the PLT affords the possibility of peer-based learning and social networking.

Conclusion

In the evaluation process of the model we have established a mapping between the reference model and the emerging list of PLE-related software developments. Moreover, the model has brought clarity to the issue of 'what is a PLE and what is not'. In particular the emphasis on service oriented architecture rules out a number of possibilities (including the current desktop operating system). At the same time, the model, whilst it specifies a particular technological configuration, still allows for a diversity of description: ultimately the question 'what is your PLE?' will evoke a diverse range of answers. This can partly be attributed to the essentially personal nature of the technology, and that the very essence of the PLE is personal ownership, but also it can be attributed to the sheer diversity of different services which may contribute to an individual PLE, and the increasing range of tools for coordinating those services.

The reference model, however, is also a response to a deeper question: that given a domain that is characterised by a multiplicity of different descriptions, is it possible to effect a coordination within that domain, even when the establishment of agreement between different descriptions is difficult to achieve? We believe that the PLE reference model, enshrining insight into the transformational processes underway in educational technology, demonstrates how effective technology provision may be planned for in an environment of diverse practice.

References

Alexander, C., Ishikawa, S. & Silverstein, M. (1977). *A pattern language; towns, buildings, construction* New York: Oxford University Press, 1977.

Attwell, G. (2006). *Why Personal Learning Environments are important*. http://81.4.66.124:8080/knownet/writing/weblogs/Graham_Attwell/entries/8463960484 [viewed 24/01/2006]
Bhaskar, R. (1979). *The Possibility of Naturalism.* New York; London: Harvester Wheatsheaf, 1989.
Blackall, L. (2005). *Die LMS, You Too PLE*. http://www.knownet.com/writing/weblogs/Graham_Attwell/entries/7498978416.
Díaz, A. & Fernández, A. (2000). A pattern language for virtual environments. *Journal of Network and Computer Applications,* 23(3), 291.
Dovey, K. (1990). The Pattern language and its enemies. *Design Studies*, 11, 3–9.
Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australian Journal of Educational Technology*, 21 (1) 82–101.
Heidegger, M. (1962). *Being and Time.* New York: Harper and Row.
Heidegger, M. (1978). *The Question concerning Technology.* In Krell, D (Ed.) Martin Heidegger – Basic writings. Routledge.
Hiebert, J. (2006). *Your goals are the future.* http://headspacej.blogspot.com/2006/01/your-goals-are-future.html [viewed 24/01/2006].
Ihde, D. (1979). *Technics and Praxis.* London: R. Reidel.
O'Reilly, T. (2006). *What is Web2.0*? http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html [viewed 2006].
Wilson, S, Olivier, B., Jeyes, S., Powell, A. & Franklin, T. (2004). *A Technical Framework to Support e-Learning.* http://www.jisc.ac.uk/uploaded_documents/Technical%20Framework%20feb04.doc
Winograd, T. & Flores, F. (1986). *Understanding Computers and Cognition.* Prentice-Hall.

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Who will own the new VLE? Sharing practice, problems and alternative solutions

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This paper reports considerations being made by those responsible for introducing staff at a large distance university to the possibilities for developing new practices around the introduction of a new institution wide VLE. How can new or emergent practices be codified into sharable representations and shared by a large and dispersed workforce? The paper considers some current solutions such as patterns, learning design and the use of toolkits by applying a framing concept of boundary objects to understand some of the problems involved in sharing emerging practices.

Keywords: Virtual Learning Environment, learning design, boundary objects, patterns, toolkits, pedagogical vocabularies

Outline of problem area

The Open University (UK) is a large distance university that emerged as an institution around broadcast technologies, essentially television and radio. The form that the university took has been described, following Peters, as an industrial model by one of its best known writers concerned with the integration of new internet-based technologies (Mason 1989). In the past 40 years the Open University has stabilised into an internationally respected, though often misunderstood, model for large-scale distance education, a mega university (ICDL 1995). Internally the teaching and learning style has been captured in a house style, issued to all associate lecturers, that embodies the spirit of the Open University: 'Supported Open Learning (SOL)'. Currently the Open University (OU) is developing what the university describes as a Virtual Learning Environment (VLE), the first phase of which will begin to be deployed university-wide in February 2007. This initiative has the potential to radically transform the way in which OU courses are delivered and supported; at the very least to provide a valuable opportunity for us to take stock and reflect on existing practice. There is a clear need for the deployment of the new VLE to be matched by staff development initiatives that try to engage members of staff in the faculties at the Open University's home base in Milton Keynes and in the regions. Alongside this need for staff development has arisen a requirement for experienced members of staff to 'surface' the knowledge and expertise thought to be locked in to the existing university staff and structures and to make this available in a way that enhances the take-up and use of the new opportunities expected to be made available by the VLE.

Goodyear (2005) argues that educational design is becoming a more complex and a more inclusive area of activity – also becoming more distributed and involving new roles, concepts, tools and methods. Furthermore, cross-institutional initiatives such as the OU VLE project raise questions about what the most appropriate methods and models are to support staff in going beyond simple technical training, towards a transformation of practice and the development of more innovative uses of technology to enhance the student experience. This is particularly important as recent research suggests that for new generations of students technologies are integral to their learning and that they are sophisticated in using technologies in a variety of ways adapted to individual niche uses (Creanor et al. 2006, Conole et al. 2006, Livingstone 2006). Technologies are no longer an innovation but an essential core tool for learning.

This paper tries to take an initial view of how, in principle, the tacit knowledge and expertise embedded in practice can be reified and circulated within an institution. We are interested in particular in focusing on abstraction of knowledge about how to create more innovative learning activities, making effective use of technologies, grounded in appropriate learning theory. Conole (in press) has argued that:

> Practitioners now have a multitude of learning theories which they can use to guide the development of learning activities. In addition there are now a rich variety of Information and Communication Technology (ICT) tools which can potentially be used in innovative ways to support the implementation of these learning activities. Despite this the actual

> range of learning activities which demonstrate a variety of pedagogical approaches (such as constructivism, dialogic learning, case- or problem-based scenarios, or socially situated learning) and innovative use of ICT tools is limited. Practitioners lack the necessary skills to make informed choices of how to use these theories and tools and are confused by the plethora of choices.

There is no claim that the discussion will lead to definite conclusions or a set of firm recommendations. Rather the aim of this paper is to specify the considerations that we need to take into account when embarking on such a process. In particular, we examine two current and popular approaches to reifying pedagogy and encouraging the development of good practices in making use of new technologies in tertiary education.

The claim we are making is that for the staff within the Open University to have some control over the new VLE they will need to be equipped with the means to critically examine the opportunities and constraints that the new technologies might imply. Our assumption is that teaching is a particular form of social practice, one based on formalised and more or less explicit theoretical knowledge alongside what has been termed implicit or tacit knowledge. The term ‘praxis’ has been used to identify actions that arise from the deliberate application of theory (DeLaat and Lally 2003). The term praxis used in this sense might be preferable to practice as it brings a sharp focus on theoretical and codified knowledge. However we would wish to qualify this use by noting that social practice is not mere behaviour and that all practice involves intentional action. Also we would point to a circularity in our argument as following the Wittgensteinian view of concepts we suggest that a concept is best understood through its use (Collins 2001, Schatzki 1996).

The OU VLE project

The OU VLE project selected Moodle as the basis for the new VLE. Moodle was selected on the basis that it was Open Source and because:

> Moodle offers significant functionality as part of the base installation. Major modules include forums, online assessment, wikis, blogs, assignments, peer review workshops, guided lessons, glossaries and course calendar. Moodle also provides core common services including authentication, authorization, logging, messaging and archiving.
> Open University VLE Programme (2006, p6).

Prior to the selection of Moodle as the platform for the new VLE an extensive study was undertaken that resulted in the OU VLE Phase 1 report, issued in 2004. This report makes a case for the introduction of the VLE in terms that go well beyond pedagogy. The OU VLE Phase 1 project identified four key aims:

- position the OU as an innovative, top quality, high profile elearning provider in the UK, Europe and other overseas markets, for staff, associate lecturers, students, clients and partners
- increase the value of the online learning experience to the learner
- facilitate partnerships
- enable OU staff to rapidly and efficiently deliver pedagogically appropriate elearning processes that directly enhance distance students' learning (whatever the course model in use).

It is the final point of these four aims that we concern ourselves with here. The Phase 1 report argues that the purpose of the VLE is to ‘facilitate elearning’ and it goes on to identify two potentially conflicting pedagogical models applied to e-learning and advises that the OU should steer a middle course between these two models.

The report calls these two approaches to elearning the broadcast and discussion viewpoints. The broadcast view is that content is primary, with the Internet seen as a delivery mechanism. A current example of such an approach is identified in the debate around learning objects. The motivation for the broadcast models, it is suggested, is the cost-effective nature of this approach. By contrast the discussion model identifies the Internet and elearning as a communication medium, emphasising *two way* communication, dialogue, discussion and community. Content is not king; the job of educators is not to deliver but to facilitate and support learning. Broadly these approaches lead respectively to instructivist and constructivist styles of pedagogy. The report sets out a view of current OU practice that sits uncomfortably with these opposed views as the OU has emphasised both the quality of its resources and materials and the quality of its support.

> Indeed, the core of the OU teaching approach has been the Supported Open Learning model (although as has been pointed out there is there is no "official" definition of this term), the essence of which is good quality teaching material and the quality of its support. (Open University VLE Program, 2004, p 11)

A key question for the implementation of the OU VLE is how to take practices developed in the earlier industrial model of the OU, based on broadcast technologies and paper, and to translate these into an Internet and Web-based system.

Theoretical background: Boundaries and boundary objects

Within education and continuing professional development in particular the idea of communities of practice has become a common theoretical framework (Wenger 1998). Wenger discusses the relationship of different communities of practice in terms of constellations of practice. When considering the movement of ideas and practices from one community to another in a constellation of practice, Wenger uses the terms 'export' and 'import'. Import and export are described as active processes that involve reinterpretation and adaptation. In this process it is the styles and discourse that can be exported and represent repertoires of practice (Wenger 1998 p 129). In a related set of ideas Brown and Duguid, following Giddens, discuss the 'disembedding' and 'reembedding' of knowledge across networks of practice (Brown and Duguid, 2001). They suggest that distinct practices can create distinct embedding circumstances and to understand how knowledge flows and where it sticks we need to understand where practices are common and where they are not. Both accounts point to the need for work to be done at both ends of an exchange to allow for a flow of information and knowledge and the disembedding or export and reembedding or import of discourses and repertoires originating in one practice to be incorporated in another. This distinguishes this approach from another tradition in which such a flow is thought of as simply transfer.

In this paper our concern is with boundary objects rather than the process of brokerage, which Wenger identifies as the way that import and export of repertoires of practice occurs (Wenger 1998 p 104–108). Boundary objects are the artefacts, documents, and other reifications around which communities of practice can organise their interactions and through which the import and export of styles and discourses, representing repertoires of practice can take place. As Brown and Duguid point out, the flow or stickiness of knowledge is related to commonalities of practice that allow an ease of movement between two contexts. In this regard it is worth making a passing remark about context. Teaching and learning, based as they are on some common frameworks and understandings, represent an area that is both deeply situated and local and one in which there is sufficient commonality of practice for there to arise an expectation that practice can be generalised. The problem we have identified then is how to allow or enable abstraction and generalisation from context specific practices in a way that assists the mobility and preservation of the practice repertoires alongside retaining a relevance and usability in local contexts.

Solutions on offer

There are many ways that practice can be shared and circulated within education. Conole (in press) suggests that practitioners use a wide range of 'mediating artefacts' to support and guide decision-making in creating learning activities (Vygotsky, 1978). The application of the use of the term 'mediating artefacts' in this context, and their role in supporting the creation and use of learning activities, resonates with contemporary thinking concerned with the relationship between tools, discourse and individuals (Engestrom et al, 1999). Insights from Cultural Historical Activity Theory have underpinned much of current socio-cultural thinking about the nature and role of semiotic tools. Different tools and resources can provide support and guidance on: the context of a learning activity, the choice of pedagogy, the creation of associated learner tasks, or any combination of these. They range from contextually rich illustrative examples of good practice (case studies, guidelines, narratives, etc) to more abstract forms of representation which distil out the 'essences' of good practice (models or patterns). Mediating artefacts can act as boundary objects helping practitioners to make informed decisions and choices in order to undertake specific teaching and learning activities.

In this section we concentrate on two alternative approaches, both of which make use of mediating artefacts and both of which make a point of situating themselves as part of a process in which the artefacts and representations are resources that can be used to make choices: toolkits and design patterns.

Toolkits

Conole and Oliver (2002) have advocated the use of toolkits as a means to support decision-making. They set out the case for toolkits by drawing together a number of currently used terms:

> A range of aids and resources to facilitate decision-making processes has developed to support the use and integration of learning technologies. As a consequence, the terms 'tools', 'toolkits', 'frameworks', 'good practice' and 'model' abound, but are very rarely used with any consistency. Indeed, there is considerable confusion and overlap within the literature on the precise nature of these types of resources. (Conole and Oliver, 2002, p 2)

Conole and Oliver go on to define the various terms in the following ways:

- Tools are artefacts located in a socio-historical context that form an integral part of human action. Such tools may be conceptual or embodied.
- Good or best practice is often used to denote guidelines that practitioners are exhorted to follow. This may disguise a moral message in so far as good or best has to be judged in relation to a framework of values.
- Models are representations, usually of systems and frequently visual representations, although formal models are more likely to be syntactic and may be defined mathematically.
- Frameworks are aids to decision-making and range from highly restrictive 'templates' or 'wizards', which provide high levels of support and step-by-step guidance to 'theoretical frameworks', which leave the user to devise their own strategy for implementation.

A number of pedagogic frameworks have been developed from particular theoretical viewpoints. Conole and Oliver (1998) developed a framework to provide a structured approach to integrating learning materials into courses that was designed to support the process of 're-engineering' a course. The framework provided for the description and evaluation of various features of a course and it could be applied at various stages working through a process of selection of alternative techniques.

More recently the DialogPlus project has produced a pedagogical toolkit which aims to guide practitioners in making informed decisions about the creation of learning activities (Bailey et al. 2006; Conole and Fill, 2005). The toolkit provides the user with layered information on each of the components involved in creating a learning activity. For example it provides details of different pedagogical approaches and links to examples of how different approaches are being used. It also gives help on the different kinds of tasks which can be used to achieve particular learning outcomes along with suggestions of ways in which these tasks can be structured. The toolkit is underpinned by a taxonomy (Conole, in press) that attempts to consider all aspects and factors involved in developing a learning activity, from the pedagogical context in which the activity occurs through to the nature and types of tasks undertaken by the learner. Learning activities are achieved through completion of a series of tasks in order to achieve intended learning outcomes. According to this taxonomy the components which constitute a learning activity are defined as:

- The context within which the activity occurs; this includes the subject, level of difficulty, the intended learning outcomes and the environment within which the activity takes place. Learning outcomes are mapped to Bloom's taxonomy of learning outcomes and grouped into three types: cognitive, affective and psychomotor and are what the learners should know, or be able to do, after completing a learning activity; for example they might be required to be able to: understand, demonstrate, design, produce or appraise.

- The pedagogy (learning and teaching approaches) adopted. These are grouped according to Mayes and de Frietas' (2004) three categories – associative, cognitive and situative.
- The tasks undertaken, which specifies the type of task, the (teaching) techniques used to support the task, any associated tools and resources, the interaction and roles of those involved and the assessments associated with the learning activity.

The taxonomy was essential in terms of providing the underpinning for the technical architecture of the toolkit and provided a means to pin down and codify practice. In particular it provided a visual representation of a 'learning activity' and helped to articulate the associated key components. In a sense it provides a crude form of reification of practice, as it helps capture and represent practice. The taxonomy makes it possible for practitioners to see the different ways in which components can be combined.

As Conole (in press) argues when comparing this approach to other more heuristic approaches to creating learning activities:

> However one could argue that this [approach based on a learning activity taxonomy] is still very much a component-based approach; as yet the relationships between the components are not well understood and hence this still does not lead to providing a template for adopting a holistic approach to designing for learning where the 'sum of the components is greater than the parts'.

A big issue is that language is not clear cut, terminology will be subtly different in different contexts and have different meaning to different practitioners, indeed even a seemingly simple term such as 'lecture' is problematic – meaning different things to different people. Furthermore, technologies continue to change and evolve at a rapid pace – new terms and ways of describing tools and their use emerge at a frightening rate (consider for example the rapid increase in discourse on wikis and podcasting, the rise of the term social software and Web .20 in the last year or so). Therefore identification of what a particular technology can be used for is problematic and again its use will change in different contexts.

Design patterns

Goodyear has popularised the idea of design patterns in the context of networked and elearning (2004, 2005). The idea of design patterns is informed by Alexander's work in relation to architecture (Alexander 1979) and has a strongly democratic ethos. Patterns offer a set of resources around which ordinary people can shape and reshape their own environment. The patterns foreground key design issues and offer alternative solutions from which choices can be made. Patterns are intended to offer solutions to recurrent problems that persist over time. They are intended to be context sensitive as the context helps to constrain and define both the nature of the problem and its potential solution. Goodyear comments that:

> In addition, patterns should also teach. They should be written in such a way that they help the reader understand enough about a problem and solution that they can adapt the problem description and solution to meet their own needs. The rationale for the pattern helps with this teaching or explanatory function. Ideally, the name of the pattern should crystallise a valued element of design experience and help relate it to other design elements such that we can create and use a pattern language. The use of patterns, then, can be seen as a way of bridging between theory, empirical evidence and experience (on the one hand) and the practical problems of design. (Goodyear 2004 p 342)

Design patterns are then a potential solution to the problem of how to surface aspects of practice so that they can be both preserved over time and made available outwith the context in which they originated.

Patterns have a structure consisting of seven main parts: a picture, an introductory paragraph describing the context of the pattern, problem headline outlining the essence of the pattern, the body of the problem including empirical data and descriptions of ways in which the pattern might occur, the solution, a diagrammatic representation of the solution and a paragraph linking it to related patterns. Patterns are considered useful because they provide a structured means of sharing practice. They are different from a taxonomy-based approach as outlined above in that they provide contextual information and although structured they are essentially more flexible in how they can be interpreted.

The OU VLE initiative: An attempt at institution wide intervention

The OU VLE implementation is a two year programme in the first instance, and the first phase of implementation will begin in February 2007, with the second phase starting one year later. The initiative, though based on Moodle, goes beyond putting in place a single technical VLE solution by trying to embrace or bring about wide scale change and innovation in OU provision, delivery and support. It is related to the development of a whole institution e-learning strategy that includes elements related to the VLE that are outside of the VLE project itself. These initiatives include structured authoring for courses, an Enterprise Content Management System and OpenLearn – an open archive of learning materials. The VLE project has a structured formal history – of consultation and agreement to a phased implementation from the vision through to the establishment of a VLE office and the creation of a range of posts. These posts include the establishment of a new set of roles – Business Process Leaders (BPLs) who lead the various different sub-projects within the VLE. There are, for example, BPLs in charge of e-assessment, library integration, learning design, mobile computing and integrated student experience (interfaces).

As this paper is being written, a large number of workshops and awareness-raising activities are taking place. Many of these focus on the individual tools integrated in the new platform such as blogs and wikis. At this stage comparatively little attention has been paid to the overall aims of the project or the pedagogical and organisational purposes that might underpin the use of such tools. It is interesting to map the components of this initiative in terms of how the different forms of mediating representations and artefacts associated with the initiative support the movement of ideas and knowledge around the university and help (potentially) bring about change. The mediating artefacts in place include:

- The BPLs themselves and their role in terms of document production, brokering their expertise with the faculties and gathering user requirements,
- A team of academic advisors who provide further documentation and provide ‘academic authority/validity’ and try to ensure a direct link into research findings and outputs,
- Workshops, a short course and s series of one-day events intended to raise awareness, provide training on particular tools, and offer opportunities to consider and reflect on the potential of the new system. All of these produce further documentation alongside activities and in the case of the short course a variety of resources and materials.
- Online materials and support – FAQs, study guides, support materials, etc.
- A range of electronic communication vehicles, including blogs by the VLE team for continuously disseminating information about the initiative and encouraging discussion.

The question for us is to what extent this apparently quite extensive range of support processes and mediating artefacts actually helps academic staff to engage with the changes taking place and make coherent choices in terms of their own practice. A traditional viewpoint might look for the gaps in the provision. Whilst this is one of our concerns we are also interested in the ‘stickiness’ of certain kinds of knowing and the ways in which new practices can be encouraged to develop. In particular we are interested in how ideas such as the toolkit approach and design patterns might be used to improve the flow across the institution.

The following table takes a list of previously identified mediating artefacts (Conole, 2005) and attempts to consider these in relation to the VLE initiative – to what extent are they being used and in what ways? We also consider how these mediating artefacts and processes might be deployed to assist in the circulation of knowledgeable and new practices in the future. Specifically, as a next step, we are interested in exploring and applying the ideas from toolkit developments and design patterns, as outlined in this paper, to the VLE initiative and in exploring their impact and relevance.

Table 1: Current and potential mediating artefacts for the VLE initiative

Narratives/Case studies – In what ways can these be captured and shared, in particular as new practices emerge?
Peer dialogue and Knowledge building – BPLs, academic advisors, new faculty appointments with a VLE remit, the VLE office team, others with an interest in the VLE are forming a new elearning Community (eLC) for the exchanging of ideas and experiences. What kinds of mediating artefacts can support engagement and sharing in this sort of grouping?
Expert guidance – VLE director and manager, academic advisors. How do the views and knowledgeable practices of experts circulate, how is expertise 'surfaced' and what can make such material accessible and useful to others? Currently presentations given at the OU centre in Milton Keynes, including those of key international figures as well as central staff, are made available by synchronous video link and stored for future use.
Networked communication –mailing lists and blogs, wikis, etc dedicated to aspects of the VLE. What allows mediating artefacts in these forms to be useful?
Tips and tricks – how could these be a) built up, b) sustained, c) targeted? And how do they relate to:-
Frequently asked questions – Currently there are limited FAQs available concerning the VLE, its tools and overall purpose. Is the FAQ an appropriate form to provide just-in-time guidance and advice?
Demonstrations – how do we demonstrate what hasn't been (fully) developed? The timeline of the OUVLE runs alongside a timeline of course production that required new courses to engage with the VLE before it is actually rolled out.
Schema/Scenarios/Patterns – initial exploration of use of patterns. What form could these take, for example in the identification of persistent problems in current teaching practice and relating these to new technologies. Can generic scenarios be used to organise case study material into a usable form?
Toolkits – a specification for a Learning Design toolkit being drawn up. Is such an approach viable or excessively rigid?
Models – How can we abstract out models of new and existing practice in relation to the evolving use of the VLE?

A key question for the authors of this paper is how integrity is maintained between the overall elearning strategy and the technological changes brought about with the new Moodle-based VLE. For academic staff who are currently designing new courses for deployment in the VLE this is a pressing concern. Courses currently in production will rollout in versions of the VLE that are, as yet, only sketchily known and understood. Perhaps most importantly the immediate concern with understanding the operation of new tools will distract from the overall conception of the VLE that is founded upon a vision of the OU becoming a digitally native institution, formed around new technologies, rather than adding Web and Internet technologies to a primarily broadcast and industrial model of distance learning.

The usefulness of patterns and toolkits in the context of the new VLE

This paper has outlined a particular problem in one institution, the need to surface knowledge embedded in existing practice to preserve and translate essential elements of that practice into a new technical context originating in the deployment of a new institution wide VLE. This paper seeks to identify core theoretical problems, on the assumption that academic practice might best be considered as praxis, an explicitly theoretically informed form of practice. Having identified a key problem in the development of reifications that were able to move across different communities or networks of practice the paper identified two alternative approaches to finding a solution to this problem.

Recently Sharpe et al. (2006) examined what might be needed to promote the adoption of technologies in tertiary education. Their aim was explicitly to increase the uptake of the VLE within a single institution. They noted that success was likely to be due to key elements of effective intervention, contextualisation, community and teachers' beliefs rather than activities per se. The elements that Sharpe et al. identify are elements of process - a form of brokerage - whereas we have focused on kinds of reification – boundary objects – that might be useful in such a process of change.

Key in our identification of the alternative approaches to reification was the notion of choice. Both the idea of toolkits and the idea of design patterns assume an active engagement with a design constituency. This seems to us to offer the best approach to the theoretical concerns we have identified and the need for a process driven solution as identified by Sharpe et al. (2006). The Open University has a quality level that has been assured by practices that are embedded in high quality resources and in high quality systems for student support. The introduction of a VLE based on fully interactive technologies can be a disruptive force, destabilising the current practices without leading automatically to a new set of equally robust or quality assured ways of working. The task we face is to develop reifications of current and developing practices, some of which are already identified in documentation around the idea of SOL (Supported Open Learning), and to develop discussion and debate about the creation of new practices around the new tools and services in the VLE. We will pursue the idea of design patterns and toolkits as we endeavour to provide sharable representations of practice that can encourage choice and the development of new practices whilst guarding against discarding essential elements of previous practice.

References

Alexander, C. (1979). *The timeless way of building.* New York: Oxford University Press.

Bailey, C., Fill, K., Zalfan. M.T., Davis.H.C., Conole, G. and Olivier, B. (2006), 'Panning for Gold: Designing Pedagogically-inspired Learning Nuggets', *Educational Technology and Society* Special Issue (January 2006), Theme: Learning Design

Brown, J.S., and Duguid, P. (2001) Knowledge and Organization: A Social-Practice Perspective. *Organization Science*. Vol 12 (2), 198–213.

Collins, H.M. (2001). What is tacit knowledge? In T.R. Schatzki, Cetina, K., and von Savigny, E. (Eds) (2001). *The Practice Turn in Contemporary Theory*, 107–119. London: Routledge.

Conole, G. (2005), *Mediating artefacts to guide choice in creating and undertaking learning activities*. Seminar to the CALRG research group, The Open University, Milton Keynes, November 2005.

Conole, G. (2006). What impact are technologies having and how are they changing practice? In I. McNay (ed) *Beyond Mass Higher Education – building on experience*, Berkshire, New York: Open University Press.

Conole, G. (in press), 'Describing learning activities and tools and resources to guide practice', in H. Beetham and R. Sharpe (eds), *Rethinking pedagogy for the digital age*, London: RoutledgeFalmer

Conole, G., de Laat, M., Darby, J. and Dillon, T. (2006) *An in-depth case study of students' experiences of e-learning – how is learning changing?* Final report of the JISC-funded LXP Learning Experiences Study project, Milton Keynes: Open University.

Conole, G. and Fill, K. (2005), 'A learning design toolkit to create pedagogically effective learning activities', *Journal of Interactive Multimedia Education,* Special issue on learning design, Tattersall, C. (ed), No. 8, available online at http://www-jime.open.ac.uk/2005/08/ (27/09/06).

Conole, G. and Oliver, M. (1998). A Pedagogical Framework for Embedding C and IT into the Curriculum. *ALT-J*, 6, (2), 4–16.

Conole, G. and Oliver, M. (2002) Embedding Theory into Learning Technology Practice with Toolkits. *Journal of Interactive Media in Education*, (8). http://www-jime.open.ac.uk/2002/8/conole-oliver-02-8-01.html [Viewed 22 July 2006]

Creanor, L., Trinder, K., Gowan, D. and Howells, C. (2006) *LEX – The Learning Experience Project*, Final report of the JISC-funded LEX project, Glasgow: Glasgow Caledonian University.

De Laat, M.F., and Lally, V. (2003). Complexity, theory and praxis: Researching collaborative learning and tutoring processes in a networked learning community. *Instructional Science,* 31(1–2), 7–39.

Engestrom, Y., Miettinen, R. and Punamäki , R-J. (eds). (1999) *Perspectives on Activity Theory. Learning in Doing: Social, Cognitive and Computational Perspectives*, Cambridge: Cambridge University Press.

Goodyear, P. (2004). Patterns, pattern languages and educational design. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds), *Beyond the comfort zone: Proceedings of the 21st ascilite Conference* (pp. 339–347). Perth, 5–8 December. http://www.ascilite.org.au/conferences/perth04/procs/pdf/goodyear.pdf [Viewed 22 July 2006]

Goodyear, P. (2005). Educational design and networked learning: patterns, pattern languages and design practice. *Australian Journal of Educational Technology* (21, 1) 82–101.

ICDL (1995). *Mega-Universities of the World: The Top Ten*. Report Compiled by the International Centre for Distance Learning. Open University.

Livingstone, S. (2006) *UK Children Go Online: End of Award Report*. Online retrieved 12/10/06 from: http://www.children-go-online.net

Mason, R. D. (1989). *A Case Study of the Use of Computer Conferencing at the Open University*. PhD, Open University.

Mayes, T. and De Freitas, S. (2004). *Review of e-learning frameworks, models and theories: JISC e-learning models desk study*. JISC.

Open University VLE Programme (2004) *Phase 1 Report*. Milton Keynes: Open University

Open University VLE Programme (2006) *Rationale for Selection of Moodle*, Milton Keynes: Open University

Sharpe, R., Benfield, G., and Francis, R. (2006) Implementing a university e-learning strategy: levers for change within academic schools. *ALT-J Research in Learning Technology* (14, 2) 135–151.

Schatzki, T.R. (1996). *Social Practices: A Wittgensteinian Approach to Human Activity and the Social.* Cambridge: Cambridge University Press.

Vygotsky, L.S. (1978) Mind in Society: *The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.

Wenger, E. (1998). *Communities of Practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press.

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An activity theory approach to the exploration of tutors' perceptions of effective online pedagogy

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The School of Education, University of Nottingham (UoN), UK and Beiwai:Online, Beijing Foreign Studies University (BFSU) Beijing, China have been engaged on a collaborative project to develop a generic module for the training of online tutors as part of the eChina-UK programme. This has led to a learner centred approach to the training that provides trainee tutors with a tool that can be used to support them in taking a critical approach to the analysis of the online learning activities. Activity theory has been used as the basis for the development of this online Learning Activity Analysis Tool which supports tutors in analysing and then discussing with their peers the online activities. The online LAAT provides a rich source of data on the tutors' perceptions of effective online pedagogy. This has the advantage over other approaches such as the use of interviews and/or scenarios in that the data is captured in context with the tutors' underlying beliefs about effective teaching and learning being elicited through the use of the LAAT. The paper describes the LAAT, its use within the tutor training module and the ways it is being used to research tutors perceptions of teaching and learning.

Keywords: activity theory, online learning, tutor training, research, pedagogic beliefs

Introduction

This paper is divided into four sections. The first section covers the context in which a tool for analysing online learning activities was developed. The second section describes the development of the Learning Activity Analysis Tool (LAAT) from activity theory and provides some screen shots of the online version. The third section considers the case for the LAAT as a tool for researching beliefs/perceptions of teaching and learning. The final section presents some tentative conclusions.

The context

The School of Education, University of Nottingham (UoN), UK and Beiwai:Online, Beijing Foreign Studies University (BFSU) Beijing, China have been engaged on a collaborative project to develop an online Masters in English Language Teaching for teachers at tertiary level (MA eELT). Details of these Higher Education Funding Council for England (HEFCE) funded developments and the wider eChina-UK programme of which this project was only one part can be found at http://www.echinauk.org/. As part of the UoN-BFSU collaboration and as a result of a user needs analysis of potential tutors for the Masters course it became clear that a 'new' approach to tutor training was needed. This resulted in further collaboration by the partners to develop a generic module for the training of online tutors as part of the eChina-UK programme, funded by the institution themselves together with HEFCE. The rest of this introductory section of the paper sets out the context for the collaborative eEducator training project and the rationale behind the activity theory based approach to online tutor training. This was as a result of the nature of the activity based tutor training conducted by Beiwai Online as well as the need for a generic learner centred approach to the module.

Tutor training in China

The approach to tutor training that exists in China supports the learning and teaching activities in the course and this has been the approach taken at Beiwai:Online for their current programmes. This tutor training programme like many in China involves face-to-face residential training in orienting the tutor to the nature of the course and their role. At Beiwai:Online there is also an online experiential component to the training which involves an exploration of the materials including an experience of using a discussion forum.

The focus of the training is on the orientation of the tutor to the types of activities in which the students are engaged. For example, one tutor training activity involves the tutor in planning a face to face tutorial and another introduces assessment of student assignments. These approaches present models of effective practice, which the tutors then follow as part of a course assignment on which they receive feedback. However Beiwai:Online are moving to compulsory online learning and this necessitates a more radical approach to the tutor training curriculum.

An ‘activity based’ approach

The UoN-BFSU materials developed for the MA eELT have self-consciously set out to include a wide range of self study, cooperative and collaborative activities which provide opportunities for students to develop as reflexive and autonomous learners using a wide range of learning tools. This experiential context for learning is ‘new’ for both the student and the tutor and thus demands a focus within the tutor training curriculum on supporting the range of pedagogic approaches used. Each activity will have its own specific demands. Each student and tutor will bring to the activity their own set of expectations and skills which will need to be considered if the outcome of the activity is to be successful in terms of meeting the course expectations and also the expectations of the students who desire a relevant, rewarding, motivating and social experience (Joyes & Chen, 2006). Our dilemma as designers of the tutor training curriculum was that a focus on specific activities that use specific learning tools means that the training programme would not be flexible enough for use across the HE sector. Our solution was to define the curriculum in broad areas, provide a tool for analysis of the online activities and focus on supporting the use of the tool. Examples of supporting activities that might be used with students could also be provided. This approach supports the tutor to develop an understanding of the context for learning in which they and their students are involved and of how to support their students effectively.

Learning activity analysis

This section of the paper describes the use of activity theory as a conceptual framework for the tutor training module and the Learning Activity Analysis Tool (LAAT) that developed from this. Screen shots of the online LAAT are also provided.

Activity theory

The conceptual framework for the tutor training module was provided by activity theory (Leont'ev, 1981; Vygotsky, 1978). Activity theory is increasingly being applied to aspects of technology-supported learning because of its emphasis on the mediation of tools and social factors on human activity. It has been used in the study of Human-Computer Interactions (Nardi, 1996) in research into online collaborative behaviour and distributed learning (Andreassen, 2000; Russell, 2002) and for supporting the eLearning design process (Jonassen, & Rohrer-Murphy, 1999).

Activity theory argues that an activity is composed of a subject, a person or a group engaged in the activity, and an object (the objective of the activity), mediated by an instrument or tool. The mediation can occur through the use of many different types of tools, e.g. material tools as well as psychological tools, including culture, ways of thinking and language. eLearning tools might be an online discussion forum, an online or paper notebook or the study approaches that support effective learning. An activity system (Engeström, 1987) shown in Figure 1 is a way of visualizing the total configuration of an activity. It has a been argued that eLearning activities that involve collaborative learning can be seen as types of learning support and can be represented as an activity system (Merrill, 2002 ; Oliver & Herrington, 2001).

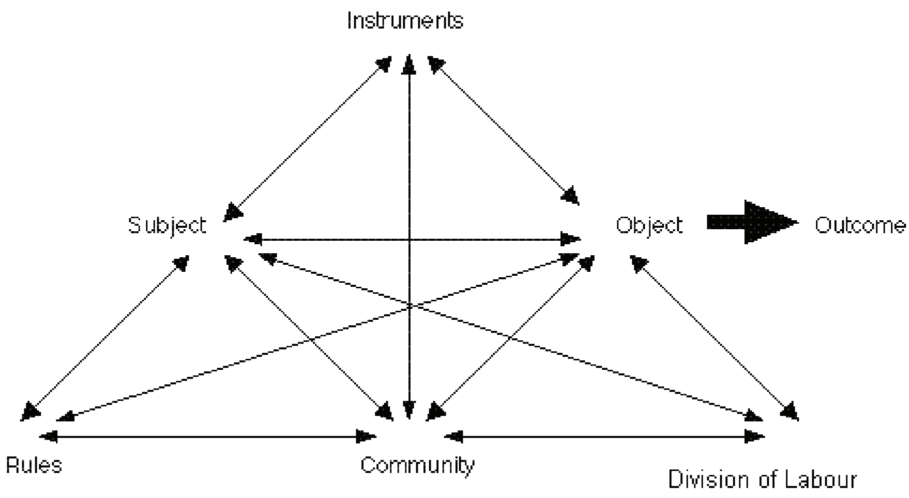

Figure 1: Model of a human activity system (adapted from Engeström, 1987)

Consider the model applied to online learning and the work activity of an online tutor within a course in higher education. The object of this work is to support the student engaged with a particular activity. The outcomes include the intended ones for the students such as ownership of the learning process and successful activity completion i.e. development of knowledge, understanding and skills and associated ones such as skills development. Unintended outcomes such as possible dissatisfaction, non-engagement, tutor-dependence behaviours can have a negative impact on learning. The instruments may include communication tools such as email, discussion fora, which may be used to support the development of understanding and encourage engagement. Other instruments may be diagnostic and pedagogic-related concepts and methods enabling the tutor to develop an empathy for and an understanding of the student within the wider context for learning in which they are working. The community consists of the tutor and their group, but may include other tutors and staff at the institution. The division of labour determines the roles taken on by students and the tutor – some of these will be determined by the institution but some will be additionally negotiated within the learning context. Finally, the rules regulate the use of time, the online behaviours, the measurement of outcomes, and the criteria for rewards (or awards).

The LAAT

The precise nature of each activity component depends upon the context for learning. Any one or more component change results in a disequilibrium that necessitates an adjustment to within the learning context. For example, a new activity may require collaboration and so may need new rules in relation to division of labour, an adjustment in terms of community expectations and new roles may need defining. Additionally in any formal course of study the relationships between the activities will also be important. For example, one activity may rely on skills or content acquired in another. This activity system model provides a preparatory tool for tutors to analyse each of these components for a learning activity. The following Learning Activity Analysis Tool (LAAT) shown in Table 1 has been developed by the UoN-BFSU team to provide a series of questions specific to each component of Engeström's Activity System and is a means of operationalising this.

Table 1: The Learning Activity Analysis Tool (LAAT). Adapted from the 8 step model (Mwanza, 2001; 2002)

Activity component	Support issues
Activity of interest	Is the nature of the activity clearly stated? Is it clear how this is related to other activities? How and when should the tutor check whether the learners have interpreted this correctly?
Objective	Do the objectives need clarifying and how might this be achieved?
Subjects	Who are the learners? What are their backgrounds? How ready are they? Do they currently have the skills/knowledge needed to carry out the activity?
Tools (mental or physical)	Do the learners need support in selecting and using the tools that might be useful to use?
Rules & regulations	What are the cultural norms involved? Is the activity compulsory or optional? Is the nature of the task something the learners would expect to carry out as part of their studies? How can difficulties due to any conflict in expectations be overcome?
Division of labour	Is there a need to support the learners in understanding and carrying out their expected roles?
Community	What is the nature of the learning environment? What are the learners' expectations in relation to community? How can their roles be supported?
Outcome	How will learners know if they have achieved the outcome? How can feedback be provided to support the achievement of the outcome? Is the assessment of the outcome aligned with the nature of the task?

The LAAT, a key feature of the eEducator training module, provides a framework for the tutor to review the learning activity system and so mediate the designed learning experience for the online learners. The LAAT provides the means of matching the designed learning activity to the current context for learning as well as the means by which the trainee tutors are supported in reflecting upon and researching their own practice.

The online LAAT

Tutors can select the LAAT from the navigation in the eEducator training module. They are provided with a choice of reading information about the background to the LAAT and also how to use it and this is shown in figure 2. Having read this 'Using the LAAT' information they can then proceed to select My LAAT from the navigation on the left. When the user selects 'My LAAT' they can view any complete or incomplete LAAT which they can chose to edit. They can also choose to create a new LAAT, at which point they are prompted for a LAAT title which should relate to the learning activity being analysed. Once the title is selected and saved users are prompted to complete an online entry for each of the components (sections in the LAAT), this screen shot is shown in figure 3. Users need to review the learning activity they are analysing whilst they are making their entries and this is facilitated by the fact that the LAAT appears as a pop up window.

Once all sections of the LAAT are complete the user is prompted to enter a summary of their analysis in relation to their understanding of the learning and teaching, the needs of the learner and their views on the nature of support required. On completion of the LAAT the user can then choose to share the LAAT with their peers. Selecting 'All LAATs' in the navigation window allows users to view any LAATs that have been shared. The expectation is that users will then engage in an online discussion with their peers moderated by a 'chair' tutor.

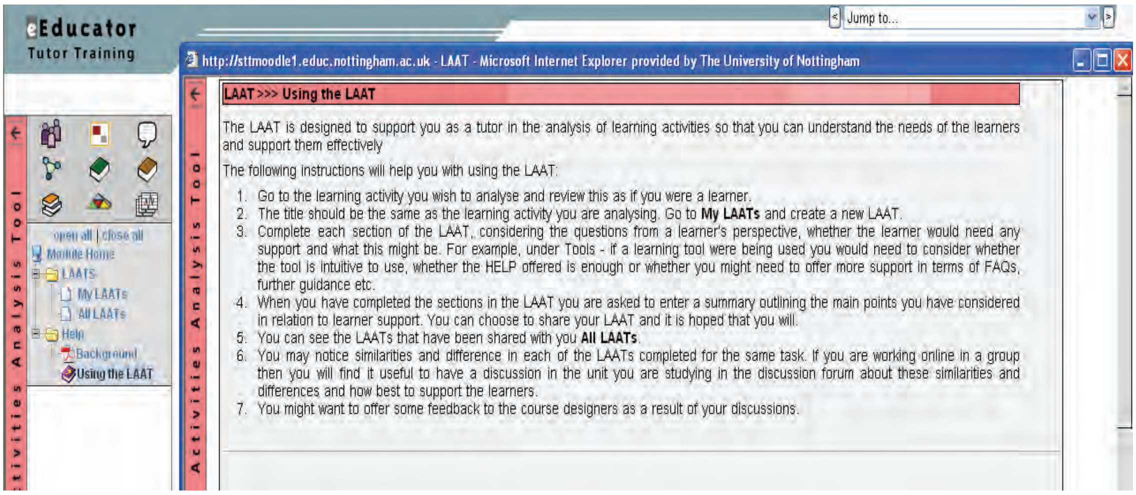

Figure 2: 'Using the LAAT' information screen

Figure 3: Making entries into the LAAT

The use of the LAAT

The third section of this paper provides an example of the ways the LAAT is being used within the eEducator module. A LAAT entry is then shown as a means of considering the efficacy of the LAAT for researching perceptions/beliefs about learning and teaching.

The use of the LAAT in the eEducator module

The following example of the use of the LAAT on the eEducator training module engages the trainee tutors in a discourse around the nature of a group reading task that has been set within one of the introductory units within the MA eELT materials. Users are asked to access this online activity and use the LAAT as a self study activity initially to review it.

The nature of the reading group activity which is presented as a series of video clips of a small reading group together with the transcripts is as follows. An experienced student is seen working with two students and the reading group activity is explained by this experienced student who acts as the chair person. This involves the students in reading a book chapter and providing a written report on the chapter which they then read to each other. The experienced student then sets the same reading group activity to the online learners who are viewing the online video presentations. The learning design sets out to model good practice in effective reading at Masters level, but it raises a number of issues in relation to what is effective reading and how one might carry out this task with students online. The pedagogic approach is teacher centred and learners are led through the materials without having any overview of the precise nature of the activities or their role in these until they are directed to 'do something'. It is not that clear whether they will be studying alone or interacting with other learners. The following example of the use of the LAAT raises many of these issues.

Table 2 shows a completed LAAT that was produced as part of the pilot of the eEducator module in 2006. This is followed by the summary of the LAAT which was produced as a result of applying it to the reading group activity.

Table 2: A completed LAAT (Title: Reading group activity – completed by Angela)

Activity component	**Support issues in relation to the reading group task**
Activity of Interest	**Is the nature of the activity clearly stated? Is it clear how this is related to other activities? How and when should the tutor check whether the learners have interpreted this correctly?** Personally I don't quite understand why the reading group is introduced in the course. At the beginning, I thought they wanted to introduce the two books. In the end, I noticed they just gave an example of how to give a book report. If so, the way to do the report was not very clear. Right before the students are asked to listen to the reading group, they need to be reminded the exact purpose of this and the tasks they are going to do after this.
Objective	**Do the objectives need clarifying and how might this be achieved?** Definitely. The objectives should be stated clearly before the reading group starts.
Division of labour	**Is there a need to support the learners in understanding and carrying out their expected roles?** There needs to be a deadline for submitting their reading report I guess.
Community	**What is the nature of the learning environment? What are the learners' expectations in relation to community? How can their roles be supported?** In this activity, learners are asked to send emails to the people who give their report in the video. There is no requirement for them to communicate with each other. Learners can be very lonely. Reading groups can be set up to help build a community. In this way, they share what they've read within their group and get support from their group members.
Outcome	**How will learners know if they have achieved the outcome? How can feedback be provided to support the achievement of the outcome? Is the assessment of the outcome aligned with the nature of the task?** I guess the system will tell the learners they've uploaded their report successfully. They should use the workspace so that they can choose to share it with peers or tutors.

Summary produced after completion of the LAAT shown in Table 2:

> In this activity, learners are asked to watch five video clips in which two book reports are included. They are also expected to write their own reports on any books or chapters they've read. I feel it is important to set it up as a group task rather than asking them to do this individually. Each group can choose a book to read and each member is responsible for one or more chapters. In this way, the reading makes more sense as they understand the book better by discussing and sharing ideas. They also get help and encouragement as well as pressure from each other. What's more, a detailed format of a book report might be needed just in case some learners need help from this aspect (Angela's LAAT entry, 2006).

The use of the LAAT as a research tool

It has been suggested earlier in the paper that data produced in the use of the LAAT has the potential for researching perceptions/beliefs of learning and teaching. The example above provides some evidence for this claim. It appears from the LAAT entries that Angela's approach to learning and teaching is markedly different to the one underpinning the online materials that she was analysing. Angela is a Chinese academic and has some experience of being an online tutor and her emphasis on peer support suggests that she values a community based or a social constructivist approach to learning (Vygotsky, 1978). The apprenticeship approach used in the materials under analysis is heavily teacher led and has resulted in a lack of clarity at the start in relation to any clearly statement of objectives. The assumption appears to be that if learners are expected to go through the materials step by step anyway then they don't need to have an overview of the complete activity and their role in it, until they are ready for this. Angela's entries indicate that she is not in agreement with the pedagogic approach being taken. She is suggesting tools for learning that support learner autonomy, for example she suggests the inclusion of peer support as well as a reading guide to scaffold the learning, in addition to the model of behaviour presented within the reading group. In the outcomes section of the LAAT in table 2 it is suggested that the workspace and peer review be used as part of the learning process and as a way of judging/improving outcomes. The workspace (Joyes, 2006) is an online tool developed by the UoN within the eChina-UK projects as a means of supporting the peer review process. It is worth at this point considering another example of a summary of the LAAT for the same reading group activity and completed by John, who is a UK academic and an experienced online tutor.

'The reading group task provides a model in which the ideas and concepts in the reading are described and then shared. These ideas are related to the students' own experiences, but are not compared to any other ideas or concepts which might be expected at this level of study. Is this model for the task adequate at this level? It could be useful to find out from the students the 'tools' they use to support their reading and reporting and agree upon what the expectations (objectives) are to be and how they might know they have achieved them (outcomes). It might be useful as this group is just forming for us to hold a synchronous video or audio conference to share our reports and hold a discussion about our findings as well as our ways of working. I would check out with the students what they think about these alternatives. An alternative approach would be to just let the task run without any support and then discuss the issues that arise afterwards, but this is probably not the best approach with a new set of students who are going to feel insecure about the learning process.' John's LAAT entry 2006.

The social construction of knowledge is quite explicit in this summary. Reference is made to valuing each learner's experiences and learning approaches and engaging them in a consideration of the nature of the task and the expected outcomes. There is a sense that the teacher centred approach is imposing a rather vague set of expectations of what it means to read and report and that this needs to be explored as part of the learning process itself.

Conclusions

The completed LAATs and the discussion about the learning activity provide a vehicle for the trainee tutors to explore different pedagogic approaches to online tutoring ranging from teacher centred to student centred and provide a means of discussing the nature of effective support within each particular learning context. This paper provides evidence of the efficacy of the use of the LAAT in providing data that can be used to research perceptions/beliefs of learning and teaching. The activity theory based approach ensures that socio-cultural dimensions of learning are considered. A key issue in research into perceptions/ beliefs of learning and teaching is the difference between espoused beliefs and actual practice (enacted beliefs). Richardson and Hamilton (1994) argue measurement and design issues might account for part of the disagreements observed. It may be that differing abilities to reflect on personal pedagogic practice as well as the diverse pedagogic language used by different lecturers and subject disciplines are part of the difficulty. The LAAT provides potential for getting close to understanding beliefs about learning and teaching by focusing on support for learners rather than exploring espoused views in relation to pedagogy.

References

Andreassen, E.F. (2000). *Evaluating how students organise their work in a collaborative teleLearning scenario: An activity theoretical perspective*. Masters Thesis. http://www.ifi.uib.no/docta/dissertations/andreassen/index.htm. [viewed 4 April 2006.]
Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki, Orienta-Konsultit. http://communication.ucsd.edu/MCA/Paper/Engestrom/expanding/toc.htm. [viewed 4 April 2006.]
Jonassen, D. & Rohrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environments. *Educational Technology Research and Development***,** 47(1), 61–79.
Joyes, G. (2006). When pedagogy leads technology, *International Journal of Technology, Knowledge and Society*, 17(1), 33–41.
Joyes, G., & Chen, Z. (2006). *Researching an on online teacher education course*. Proceedings of the Asia TEFL conference, Beijing Higher Education Press.
Leont'ev, A.N. (1981). *Problems of the development of mind*. Moscow: Progress Publishers.
Merrill, D. (2003) First principles of instruction. *Educational Technology Research and Development*, 50(3), 43–59.
Mwanza, D. (2001). Where Theory meets Practice, A Case for an Activity Theory based Methodology to guide Computer System Design. In H. Michitaka (Ed.) *Proceedings of INTERACT '2001: Eighth IFIP TC 13 International Conference on Human–Computer Interaction* (pp. 342–349). IOS Press, Oxford.
Mwanza, D. (2002). Conceptualising work activity for CAL systems design. *Journal of Computer Assisted Learning*, 18(1), 84–92.
Nardi, B.A. (Ed.) (1996). *Context and consciousness: activity theory and human-computer interaction.* Cambridge, MA: MIT Press.
Oliver, R., & Herrington, J. (2001). *Teaching and learning online: A beginner's guide to eLearning and e-teaching in higher education*. Perth, Western Australia: Centre for Research in Information Technology and Communications, Edith Cowan University.
Richardson, V., & Hamilton, M. (1994). The practice argument staff development process. In V.Richardson (Ed.), *Teacher change and the staff development process: A case in reading instruction*. New York: Teachers College Press.
Russell, D.R. (2002). Looking beyond the interface: activity theory and distributed learning'. In R.M Lea & K. Nicoll (Eds.) *Distributed learning: social and cultural approaches to practice*. London: Routledge Falmer.
Vygotsky, L.S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA, Harvard University Press.

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Reinventing and reinvigorating instructional design: A theory for emergent learning

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This paper explores emergence theory as a means to interpret and redefine current approaches to and models of instructional design. Based on their extensive practical and research experience and through examples from multi-disciplinary perspectives, the authors discuss key factors from the discourse of science and architecture that are missing from contemporary instructional design approaches. Using this analysis, the authors elaborate a theory of emergent learning that transcends many existing approaches to the design and implementation of educational programs and resources. By applying this theory, it is proposed that learning can be understood from more complex and 'chaotic' perspectives, and consequently more amenable with and aligned to emergent social, recreational and educational networks.

Keywords: emergence theory, instructional design

Introduction

In the field of education, instructional design has traditionally been applied using established models, typically using a top-down approach, that focus on explicit definitions of audience, environment, strategies, activities and outcomes. However, when different traditions of design are considered, more creative and organic elements are emphasised, which also embrace a 'bottom-up' strategy. In this paper the authors present a case that advocates using alternative concepts of design, integrated within emergence theory, to redefine the way we conceptualise and implement online teaching and learning environments.

On the nature of design and problem solving

For several decades, architectural design theorists and methodologists have analysed and developed approaches to creative problem solving activities that have aided the designer in continually improving design methods and process models (Kays, 2003). Design methodology has since developed through cross-disciplinary efforts between architecture, engineering design, industrial design, interior design, and more recently, software and interface design. However, this considerable body of knowledge has not yet been sufficiently recognized in the field of instructional design.

One important area to consider relates to problem solving. Architects and other three-dimensional designers deal with highly complex, multi-dimensional, and interactive design problems, as well as an ever-increasing body of information and technological change. Alexander (1964) noted in his design treatise, *Notes on the Synthesis of Form,* that to turn a problem into form, "we need to make explicit maps for the problem's structure, and therefore need first to invent a conceptual framework for such maps" (p. 132). Such proponents of design methodology suggest that following a design process allows for a greater understanding and organization of highly complex problems by defining patterns and pieces of the overall form, deconstructing a multifaceted design problem into manageable component parts. However, when comparing these problem-solving strategies with today's instructional design practices, we find that while many forms of design deal with systemic and chaotic thinking, this is not characteristic of instructional design practice. This leads to a range of questions about how designers think, such as: How do they go about solving complex problems? Is there a method that maps their process? How does creativity influence their problem solving methods? (Kays, 2003; Kays & Francis, 2004). For instructional designers, addressing these questions can shift the way teaching and learning environments are conceptualised and implemented.

From another perspective Rowe (1987) suggests such design problems can be thought of in terms of *well-defined* (clear problem, clear solution), *ill-defined* (neither problem nor solution have clarity) or *wicked* (as for ill-defined problems but with no shared agreement on solution options). Rowe (1987, p. 41) also presented four key characteristics of wicked problems: (a) without a definitive formulation, (b) with no explicit basis for termination – they can be developed still further, (c) the differing formulation of the problem implies different solutions and vice versa, and (d) the problem's proposed solutions are not necessarily correct or incorrect – plausible alternative solutions can always be provided.

With respect to instructional design for online learning this has particular relevance. First, we argue that problems inherent in designing effective online learning environments are often ill-defined, requiring alternative approaches to implementation and the ways learners interact. Second, given the variety of individual learning styles that must be accommodated and the variations the Internet makes possible, we argue that instructional design must be reassessed within a broader context (Kays & Francis, 2004; Sims, 2006). Third, the complexity of interactions between participants and stakeholders within the online learning dynamic can make instructional design problems *wicked*. To allow for more flexible problem-solving and to extend the learning environment, we believe the application of emergence theory is important for the field of instructional design to meet changing needs in student learning (e.g. Ulmer, 2003) and the emerging technologies such as social networks and communications.

Emergence theory

As discussed in Irlbeck, Kays, Jones & Sims (2006), the origins of emergence theory can be traced to a seminal paper by Weaver (1948), where life sciences were considered to deal with real human problems, addressing neither the simple problems of classical physics nor the disorganized complexity of quantum mechanics. Subsequent studies of widely dissimilar organized phenomena such as slime moulds, ant colonies, and human cities were drawn together by Johnson (2001) into a new scientific perspective called "emergence." The key to understanding this new perspective, according to Johnson, lay in appreciating that simple interactions of the elements in a system – without any central top-down control – can lead to the emergence of highly complex, intelligent behaviours, which also aligns with a *wicked* problem solving context. Applied to the instructional design context, this approach implies a radical shift in the role of designers and the expectations for participants in the environments created.

In these emergent systems there is no controlling agent or pacemaker, and systems operate from the bottom-up, organizing themselves by creating feedback loops that encourage other agents to join the group. For a system to be considered emergent, the interaction must create a macro behaviour, while high-level patterns arise from the complex interaction between the agents. Emergent behaviour also has the quality of adapting, growing smarter over time and responding to changing needs of the environment (Johnson, 2001), and this concept of emergence is now being seen in online gameplay communities (Webb & Sims, 2006). Importantly, the study of emergent behaviour has moved from the laboratory into the mainstream of our everyday lives, and we argue that it is not merely a case of implementing an revised instructional design model, but rather using behaviours and activities within the broader instructional design system as a means to allow complex and intelligent behaviours, and higher level learning, to occur spontaneously. The application of emergence theory to the design of online distance education derives from viewing the e-learning environment and the learning process itself as a problem in organized complexity. The elements in it – students, instructor, resource materials, environment – interact spontaneously, even randomly, and are shaped by social processes of a natural alignment of the concepts for learning and dynamic group behaviour (Kays, 2003).

Conceptualizing instructional design from the perspective of different design methodologies, wicked problem-solving techniques and emergence theory is a radical extension to learner centered design, supporting explicitly on spontaneity and creative learning outcomes. More importantly it aligns with other speculations on the nature of online learning and roles of the various participants (Sims & Jones, 2003; Sims & Hedberg, in press). While the principles of emergence may well be more suited to the generation of experienced, sophisticated learners with more technological experience and the ability to create their own dynamic learning environments, emergence theory contains the essence to fully realize the potential of online distance education and the affordances of networked communities. We are at the threshold of seeing the traditional instructional design ethos shift to one that is emergent rather than systems or process oriented.

Given this context, we therefore present a theory of emergent learning to counter existing paradigms of instructional design and provide a forum for debate on effective practices of online teaching and learning.

A theory of emergent learning

Our theory of emergent learning proposes that to realize the true benefits of online learning, such as community, collaboration and personalised learning, it is necessary to relinquish the control that we see being imposed by enterprise learning management systems, complex institutional administrative environments and antiquated teacher-centred instructional environments. By removing these controls learners will become the central focus of the pedagogy and, from many perspectives, the role of the teacher and trainer will shift and diminish significantly (Siemens, 2004).

The underlying principle of a Theory of Emergent Learning (TEL) is that it is essential to understand educational empowerment and emancipation from the learners' perspective (cf. Ulmer, 2003; Prensky, 2005). More importantly, the extent to which learners engage with and generate meaning from the various interactions and encounters that exist within online systems can only benefit if within an emergent context. We argue that we have the challenge to totally rethink what it means to 'design' a learning system and to re-consider the way we address and attempt to (re)solve the various problems that such environments afford. Rather than focus on the predictable, the 'designer' must extend existing and develop new pedagogies where the learning and the outcomes are both unpredictable and emergent – and yet remain significant in terms of their relevance and application to the individual. To achieve this means allowing a learning system to 'be' and to 'grow' and to 'emerge'.

In proposing this theory we identify some critical tenets:

- the learner has the potential to advance and define their own essential knowledge base
- the very uncertainty and lack of predictability of learning outcomes will be the key factor that adds value to a learning community
- emergent systems will provide the necessary triggers to enhance knowledge and understanding
- emergent learning will be one of the critical triggers to unleash individual creativity.

While we are not advocating an open environment without framework or rules, we are reinforcing the importance of a bottom-up approach, where the complexity, creativity and flexibility of the human is given opportunity to flourish and for knowledge and learning to consequently emerge.

The key for implementing emergence theory is to establish an environment with a set of simple rules and in which students are able to establish complexity in terms of their individual interactions. For example, in the same way that trained musicians can get together and jam and create a new composition, so can it be with learning. A group of learners with shared understanding of a content base could get together and allow their combined knowledge to generate new thoughts and ideas emerging from their environment. A second example would be an online discussion thread where there are no explicit outcomes and students, through their deliberations, establish concepts or outcomes that can have a limited 'life' in terms of whether the group develops the ideas or not.

Conclusion

We have articulated this theory based on our individual experiences as academics, researchers and online educators. Those experiences have led us to see anomalies in the current ways of design for online education, and (as Laszlo, 2004, p.19 reminds us) "investigating the anomalies that crop up in observation and experimentation and coming up with fables that account for them make up the nuts and bolts of fundamental research in science". This is our 'fable' and presenting our theory of emergent learning is designed to articulate a resolution for those anomalies. By challenging the current and dominant paradigm of instructional design means that we can more effectively test our assertions and come, within the academy, to better understand the true dynamic of online, networked learning.

References

Alexander, C. (1964). *Notes on the synthesis of form,* Cambridge: Harvard University Press.

Irlbeck, S., Kays, E., Jones, D. & Sims, R. (2006). The phoenix rising: Emergent models of instructional design. *Distance Education*, 27(2), August 2006, pp. 171–185.

Johnson, S. (2001). *Emergence: The connected lives of ants, brains, and software.* New York: Simon & Schuster.

Kays, E. (2003). Creating emergent discourse: A critical ingredient in e-learning. *Proceedings of ELearn 2003: World Conference in E-Learning in Corporate, Government, Healthcare, & Higher Education*, Phoenix, AZ (pp. 252–256).

Kays, E. & Francis, J.B. (2004). *Emergence and e-learning: From artificial to natural selection. Proceedings of ELearn 2004: World Conference in E-Learning in Corporate, Government, Healthcare, & Higher Education*, Washington, DC (pp. 1286–1289).

Laszlo, E. (2004). *Science and the akashic field: An integral theory of everything*. Rochester, VE: Inner Traditions.

Prensky, M. (2005). *Engage me or enrage me: What today's learners demand*. Accessed from http://www.educause.edu/ir/library/pdf/erm0553.pdf, 8th February 2006.

Rowe, P.G. (1987). *Design Thinking*. Cambridge, MA: The MIT Press.

Siemens, G. (2004). *Connectivism: A learning theory for the digital age*. [Online] Available: http://www.elearnspace.org/Articles/connectivism.htm. [6th October 2006].

Sims, R. (2006). Beyond instructional design: Making learning design a reality. *Journal of Learning Design*, 1(2). Online: http://www.jld.qut.edu.au.

Sims, R. & Hedberg, J. (in press). Encounter theory: A model to enhancing online communication, interaction and engagement, in C. Jawah (Ed) *Interactions in Online Education: Implications for Theory and Practice*. London, UK: Routledge Education.

Sims, R., & Jones, D. (2003). Where practice informs theory: Reshaping instructional design for academic communities of practice in online teaching and learning. *Information Technology, Education and Society*, 4 (1), 3–20.

Ulmer, G.L. (2003). *Internet invention: From literacy to electracy*. New York: Longman.

Webb, R. & Sims, R. (2006). Online gameplay and online gameplay communities: Ten reasons why they matter. *AusWeb 2006 Conference Proceedings.* Online: http://ausweb.scu.edu.au/aw06/papers/refereed/webb/index.html

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Questioning the net generation: A collaborative project in Australian higher education

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This paper describes a project, which has been supported by the Carrick Institute for Learning and Teaching in Higher Education, that aims to identify how the technology-based tools of a new generation of students can be successfully used by higher education. Recent commentaries propose that Universities are ill-equipped to educate a new generation of learners whose sophisticated use of emerging technologies is incompatible with current teaching practice. This project will investigate this proposed gap between learners' and teachers' use of technologies and identify the implications for higher education. This paper presents the rationale of the project, highlighting its critical stance on current notions of the 'Net Generation'. The three phases of the project – Investigation, Implementation and Dissemination – are then described. The project will be undertaken as a collaboration between staff at The University of Melbourne, the University of Wollongong and Charles Sturt University. In the final stages of the project, members of the ascilite community will be able to participate in practical workshops based on the lessons we have learned from questioning the 'Net Generation'.

Keywords: net generation, digital natives, learning, educational technology

Project rationale

Considerable attention has been given recently to the 'Net Generation', also called 'Digital Natives' or the 'Y Generation'. This group of individuals, born between 1980 and 1994 (McCrindle, 2006), have been characterised by their familiarity with and reliance on information and communication technologies (ICTs). They have "spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age" (Prensky, 2001a; p. 1).

A number of authors have argued that the digital culture in which the Net Generation has grown up has influenced their preferences and skills in a number of key areas related to education. For example, the Net Generation are said to prefer receiving information quickly; be adept at processing information rapidly; prefer multi-tasking and non-linear access to information; have a low tolerance for lectures; prefer active rather than passive learning; rely heavily on communications technologies to access information and to carry out social and professional interactions (Prensky 2001a, 2001b; Oblinger, 2003; Gros, 2003; Frand, 2000). Authors have also questioned the extent to which higher education practitioners are equipped to meet the needs of this incoming cohort of students. Prensky (2001a) labels lecturers in higher education ‘Digital Immigrants’; foreigners in the digital lands of the Net Generation. He also suggests that the disparity between the ICT experiences of current students and the sophistication and degree to which these technologies are employed by teaching staff is the “the biggest single problem facing education today” (p. 2).

Despite the considerable recent attention devoted to the Net Generation, few studies have documented the characteristics of this group. Moreover, little empirical evidence has been provided to support claims made about the Net Generation and its implications for higher education (for a rare exception, see Kvavik (2005). Furthermore, a number of fundamental assumptions made by commentators on the Net Generation warrant critical examination. First, it is assumed that all commencing first year University students are part of the ‘Net Generation’. However, this group is not homogenous – Jonas-Dwyer and Pospisil (2004) predict that on the basis of age, 40% of students enrolling in undergraduate studies in 2006 will not be part of the Net Generation. Krause (in press) confirms the heterogeneity of the first year student population and its consequences for ICT use, noting that mature age students were significantly less likely than school-leavers to use online course resources. A second assumption is that all first year University students have a sophisticated knowledge and understanding of ICTs while teachers in higher education are largely technologically illiterate and need to improve their ICT understanding and practice. Such broad generalisations risk overlooking a more complex mix of ICT skills and knowledge among student and teacher populations. Finally, there is an inherent assumption that because students are using particular technologies in their everyday lives this warrants their use in teaching and learning. However, it is not clear that students want their ‘everyday technologies’ to be adopted or appropriated as ‘learning technologies’. Moreover, it is not clear that emerging technologies and students’ everyday skills with them will easily translate into beneficial technology-based learning. Many in our community understand the care and planning needed to successfully integrate technologies within well-designed learning and teaching contexts in specific discipline areas.

This project will examine these assumptions and is clearly aligned with core components of this year’s ascilite conference theme. This year the program convenors have asked us to think about how well we know our students and how we can ensure we meet their real needs and not what we imagine they might need. They also ask us to consider the characteristics, habits and demands of the Net Generation and encourage us to respond to their expectations. This project directly targets these issues and takes a critical approach to them. The next section of this paper outlines the way in which we will undertake this work.

Project methodology

This project will particularly focus on students’ use of new and emerging technology-based tools in three areas: communicating, publishing and file sharing. Traditional digital communications technologies (mobile phones and email) have recently been supplemented by other web- and phone-based communications tools, including instant messaging software (e.g. Messenger), social networking software (e.g. Friendster), and discussion forums. SMS or Text messaging has become an integral communication activity for young people; a recent study at The University of Melbourne found that 96% of first year students have unlimited access to a mobile phone with 80% using it on a *daily* basis to ‘text’ others (Kennedy, Krause, Churchward, Judd & Gray, 2006). Using the web as a tool for personal digital publishing has increased in popularity over the last five years, predominantly in the form of web pages, blogs and wikis. The Melbourne University study referred to above found that 35% of first year students had contributed to their own blog in the last year with 21% contributing to it on a weekly basis (Kennedy, et al., 2006). Web syndication and RSS feeds have facilitated the distribution of material published on the web. It has particularly facilitated the distribution of audio or video files (podcasting) and allows people to download and play audio and video clips on their own computers, mobile phones or MP3 players. Individuals are also using the web to share material such as photographs or images (e.g. linklist).

Thus, in addition to the more entrenched technologies (e.g. email), this project will focus on how students use emerging technology-based tools such as: web-based communications tools including instant messaging and social networking; text-based mobile phone communication; online publishing using blogs and wikis; digital file sharing using the web and mobile phones; the use of the web to access published material particularly via RSS feeds or syndication and the use of MP3 players for audio streaming and podcasting.

The project will be conducted in three stages: Investigation, Implementation and Dissemination. The Investigation stage will begin by documenting how first year University students and their teachers are routinely using emerging technologies and technology-based tools in their day-to-day activities and to support students' learning experiences. This stage will comprise two phases of data collection. In the initial phase, a questionnaire will be circulated to first year students in a range of disciplines across the three participating institutions. This questionnaire will ask students about the degree to which they access and use technology-based tools, how they currently use technology to create and exchange information and knowledge, and their perceptions of how technologies could be better used in their studies. A questionnaire asking broadly similar questions will be circulated to teachers in the students' discipline areas. This will ask teachers about their experience and skills with a range of technologies and technology-based tools and how they currently use technology to support student learning. In the second phase of the Investigation a series of focus groups will be conducted with students to better understand their use of the most popular technologies. Focus groups will provide an opportunity to gather more detailed information about how students use specific technologies for particular purposes, what they like about popular technologies, and to explore ways in which these technologies could be harnessed for educational purposes. A second series of focus groups will be conducted with teaching staff, educational designers, course coordinators and IT coordinators to determine the feasibility of harnessing students' existing use of popular technologies for education purposes. Facilitators and barriers to the use of emerging technologies and technology-based tools in local learning contexts will be investigated in this forum.

The findings and outcomes from the Investigation stage will be used to identify Pilot Projects for the Implementation stage. For example, the Investigation stage may suggest how blogging, social networking, podcasting or file sharing can be implemented to support and enhance students' learning activities. It is expected that four specific technology-based tools in the interrelated areas of communications, publishing and file-sharing, will emerge from the Investigation stage and two trials of each technology-based tool will be implemented (i.e. eight Pilot Implementation Projects in total). Each pilot project will be evaluated iteratively during the course of its implementation, with a particular emphasis on aspects of the innovation that are working well (and why) to determine the learning processes and outcomes that are beneficial for students and teachers.

The third stage of the project, the Dissemination of the project's outcomes, will be grounded in the lessons learned from the pilot projects and the findings from the Investigation stage. A key element of the dissemination strategy will be the development and distribution of *A Teachers Handbook* and a *Teachers Toolkit*. The *Teachers Handbook* will provide a practical guide on how to integrate technology-based tools into local learning environments. The *Teachers Toolkit* will provide a suite of concrete resources (generic learning designs, templates, lesson plans, checklists and technical implementation plans) that can be used by teachers to facilitate the use of emerging technologies and technology-based tools in local teaching and learning contexts. A key dissemination strategy will involve members of the project team conducting staff development workshops with teaching staff and institutional staff developers at Universities in major capital cities of Australia and at annual conferences such as ascilite.

Conclusions

While a great deal has been written about the Net Generation – with some commentators even suggesting educators alter their teaching practices to better suit these Digital Natives – very little empirical research has actually questioned the Net Generation about their experiences with technology and worked with educational practitioners to determine the implications this has for Higher Education. Members of the ascilite community who are experts in this area once again face the challenging balancing act of not overreacting to the 'techno-hype' voiced by Prensky and others while at the same time being aware of potential changes in the needs and expectations of a new generation of students.

Our response to this challenge will be to gather empirical evidence about the degree to which students and their teachers in three diverse universities are using emerging technologies. Based on this evidence and with the support of local staff it aims to develop and implement appropriate technology-based tools in local learning and teaching contexts. From these activities the project team will develop empirically and pedagogically-based guidelines for integrating emerging technologies into local teaching and learning environments. The appropriate adoption of emerging technology-based tools in higher education can only be carried out after asking questions and considering the responses critically.

References

Frand, J.L. (2000). The information-age mindset: Changes in students and implications for higher education. *Educause Review*, September-October, 15-24.
Gros, B. (2003). The impact of digital games in education. *First Monday*. Available online: http://www.firstmonday.org/issues/issue8_7/xyzgros/index.html [visited April 19, 2006].
Jonas-Dwyer, D. & Pospisil, R. (2004). The millennial effect: Implications for academic development. In *Transforming Knowledge into Wisdom: Holistic Approaches to Teaching and Learning, HERDSA 2004 Conference Proceedings* (pp. 195-207).
Kennedy, G., Krause, K., Churchward, A., Judd, T. & Gray, K. (2006). *First Year Students' Experiences with Technology: Are they really Digital Natives?* Internal report, The University of Melbourne.
Krause, K. (in press). E-learning and the E-Generation: The changing face of higher education in the 21st Century. In J. Lockard & M. Pegrum (Eds.), *Brave new classrooms: Educational democracy and the internet*. New York: Peter Lang Publishing.
Kvavik, R.B. (2005). Convenience, communications, and control: How Students Use technology. In D. Oblinger & J. Oblinger (Eds.) *Educating the Net Generation* (pp. 7.1-7.20). Boulder: EduCause.
McCrindle, M. (2006). *New Generations at Work: Attracting, Recruiting, Retraining & Training Generation Y*. McCrindle Research. Available online: http://www.mccrindle.com.au/wp_pdf/NewGenerationsAtWork.pdf [visited July 19, 2006].
Oblinger, D. (2003). Boomers, Gen-Xers & Millennials. Understanding the new students. *Educause Review*, July-August, 37-47.
Prenksy, M. (2001a). Digital Natives, Digital Immigrants. *On the Horizen*, 9(5).
Prenksy, M. (2001b). Digital Natives, Digital Immigrants, Part II. Do they really *think* differently? *On the Horizen*, 9(6).

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A partnership for iPod pedagogy: Using the technology of millennial learners across educational contexts

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This paper explores collaboration between researchers at the tertiary level, with primary school teachers and their students as iPods are integrated into learning experiences. Embarking on this partnership, it is our aim to weave value-added, mutually beneficial and collaborative relationships into our on-going professional interactions as we work towards the development of a pedagogical framework to support classroom teachers in using iPods and podcasting in their educational settings. Such collaborative relationships have been promoted as a way to foster professional relationships, provide learning opportunities for educators, encourage change and develop common understanding across contexts.

Appropriate pedagogy and procedures to assist educators in the incorporation of this technology within their classroom context have begun to emerge through professional collaboration, observation of the students and interviews with both teachers and students. This study provides example for educators who collaborate with researchers to incorporate new technologies into their teaching. It also presents our experiences with team building and communication, which have proven valuable in the process of integrating iPods and podcasting into learning activities for children.

Keywords: iPods, pedagogy, implementation, mobile technology, primary education

Introduction

Educators have been called to reconsider the technological needs, skills and preferences of students when providing for classroom learning experiences. While the inclusion of technology has been promoted, in many instances little support has been given to teachers both in terms of skills and support in meaningful integration of these in learning experiences. While the use of iPods, podcasts and other personal on-demand technologies continue to increase within contemporary society, it appears that many educational settings have not yet adapted to accommodate their use. This project aims to investigate the stages involved in implementing iPods and podcasting into primary school classrooms.

Supporting the needs of millennial learners

It has been asserted that millennial learners need to be taught using the technology they are accustomed to (Dede, 2005). In this paper we argue that primary teachers face challenges and need to review the tools they use in teaching and learning experiences. Enabling students to focus on what they determine is the necessary material to be at any given time is one strength of the personal on-demand nature of the podcast / iPod relationship. Building the developing pedagogical understandings around this relationship is a necessary step in the evolution of the use of this technology in educational contexts within contemporary society. Pedagogical frameworks to assist educators in the incorporation of this technology within educational contexts do not yet exist in the literature.

There has been a global movement to implement modern education technologies in universities (Oliver, 2001). After reviewing the literature, we have found minimal evidence of the educational implementation of personal on-demand technologies. Belanger (2005) presented detailed findings about academic uses for iPods in tertiary settings. Miller and Piller (2005) present the use of iPods in tertiary setting as a solution to the challenge of providing course content in dual audio and visual modes. None of the reviewed sources delve to any great extent into the pedagogy behind the use of iPods in their educational settings as most focus on the technology and functionality of the iPod itself. There is some focus on the use of podcasts within the literature (for example, Cebeci & Tekdal, 2006; Crawford, Smith, & Smith, 2006; Flanagan & Calandra, 2005). Information presented in these sources often include details regarding Really Simple Syndication (RSS) feeds, media aggregator software, podcast subscription explanations, and how to create and podcast content. The literature presents a need to explore the uses and pedagogy involved with using iPods in addition to podcasts with millennial learners across educational contexts.

Partnership to support the change

The success of any educational project is largely dependent on its implementation (Clarke, Butler, Schmidt-Hansen, & Somerville, 2004; Volery, 2001). In response to this, we see partnership between the tertiary and primary contexts as a way to support this process. Such collaborations can enhance professional learning as the teams pool knowledge in the quest for shared understandings. Darling-Hammond (1997) acknowledges that such discussion and collaboration provides avenues for professionals to articulate their thinking as they communicate ideas to each other and work towards a shared vision. Such partnerships need time for talk and collective action amongst participants.

Partnerships between tertiary and primary contexts are often conceived as a way to bring about change. The process of bringing about educational change is indeed a complex process. Hoban (2002) identifies the "…multidimensionality and problematic nature of educational change" and the implications it presents for "…thinking about the nature of teaching, teacher learning and the change process" (p. 40). Collaboration between researchers and teachers is a way to foster professional relationships, bring about change and develop common understandings across contexts. This paper reports on our experiences working with a school / university partnership as we look to what we know about using iPod and podcasting technologies from tertiary settings, and how this can inform their introduction in the primary context.

The project: Establishing the partnership

This paper reports upon the initial data collection process of a partnership created between two researchers at one university, and two Grade 4 teachers located at two different primary schools local to the university. An action-learning framework guides the project as the different personnel collaborate on the introduction of iPods within the two Grade 4 classrooms. At the time of writing, the iPods have been introduced to the students and they have used them in their classrooms for a ten-week period. Data has been collected focusing on the process the teachers and researchers engaged with as they constructed this initial ten-week program to incorporate the iPods into their classrooms. This planning, implementation and data collection process has been tempered due to mandated curriculum expectations. Data collected to date includes researcher observations during times of collaborative planning, semi-structured interviews with the teachers and individual students at scheduled intervals over the ten-week period. Data have been analysed by identifying and coding categories based on the emerging themes.

Working together as co-learners

Once the project team was established, it became necessary to identify the specific roles and responsibilities for each. We recognised that personnel from both tertiary and primary contexts have tremendous knowledge they are able to bring to the project. It was our aim to weave value-added, mutually beneficial and collaborative relationships into our on-going professional interactions. Each team member spent some time familiarising themselves with the iPods before any discussion of classroom implementation began. This was an important process as we all needed to be familiar with the technology and resulted in much discussion about issues of organisation and management with the iPods. The iPods were divided amongst the two classes according to the needs expressed by the teachers. Teacher A expressed interest in using the iPods with the whole class, therefore 14 were allocated to this class enabling one iPod to be shared between two students. Teacher B identified a small group of students in the class who she felt would particularly benefit from using the iPods, so 5 iPods were allocated to this class. Teacher B expressed her vision that after the initial focus these children would become the 'experts' who could then assist other students in the classroom.

The entire team formally met twice in this initial phase to collaboratively plan teaching and learning experiences to incorporate the iPods within the Grade 4 classrooms. During this time the team members looked to the literature for examples of how iPods had been used in educational settings and deconstructed these with view of what they could "look" like in their Grade 4 classrooms. From this, we were able to begin to plan some ideas for the first phase of the project. Together we built on the mandated curriculum outcomes and the teachers' individual school and classroom contexts with the aim of developing both authentic and meaningful learning experiences for the students.

The teachers decided a focus on the English curriculum area was most appropriate for their students. Both teachers are required to develop literacy skills within the curriculum strands of reading, writing, talking and listening. Incorporating the iPods within talking and listening experiences would enable purposeful connections between the technology and literacy teaching and learning experiences. Both teachers emphasised the importance of the children becoming "knowing speakers … as they were exposed to the talking of others beyond their immediate world" and "knowing listeners, listening with both 'inner' and 'outer' ears" (Winch et al., 2001, p. 297). Within the literature, this is presented as an area requiring additional consideration in many classrooms. A unit of work centred on the deconstruction and creation of radio plays was developed. Five key focus areas for the students to engage with were incorporated: investigation and deconstruction of oral texts; exploration of the parts of a radio show; creation of the parts of a radio show; putting together the class radio show; and evaluation of the radio show.

In the implementation of this unit of work, both teachers were conscious that in their classrooms they weren't "teaching iPods", instead the aim was for the seamless integration of the tool to support student learning. The teachers both identified that initially there needed to be some emphasis on teaching about specific features and explicit modeling of how to physically use the tools. Mid-way through the unit, one of the teachers commented, "they [the children] focus on the technological side of things a lot rather than the language features of the audio text". This was further supported by interviews conducted with the students where a consistent theme was the children identifying specific features and capabilities of the iPods rather than how they supported the creation of the radio show.

Throughout the implementation of the unit, there were numerous technological 'hitches' that we were forced to overcome. For the teachers, having a partnership with researchers provided them with support to deal with these issues as they arose and the team became co-learners as they worked together to solve problems as they emerged. The types of problems varied from the repercussions of different versions of applications on classroom computers to using downloaded sound files in various formats

Both researchers were able to have considerable presence in each of the classrooms as they visited for periods of observation, demonstration, to conduct interviews and talk with students and parents. In addition, a listserv was developed to provide a forum for the team to talk to each other where questions were raised and observations shared.

What we have learned so far

As we write, the project is in its neophyte implementation stage. We have been actively meeting as a team; sharing expertise, voicing concerns, planning for implementation and identifying future directions. After the first ten-week focus that has been implemented in classrooms and from talking with the children in the semi-structured interviews, they appear to enjoy the time that they spend using the iPods and have made significant learning gains within the talking and listening strand of their English curriculum. As a team we have learned some valuable lessons. Each of our involvement with the project, the shared vision and trials with the actualisation of this has been wrought with excitement, frustration and many tense conversations. We have learned the importance of open and continued communication between contexts and the necessity for each of us to be active co-learners throughout the project.

There has been considerable learning for all team members. The teachers report they have learned a lot about the technology and this learning curve was steep with regard to the file distribution system and the preparation of files to be used in class. The majority of postings to the listserv were focused on such issues. The teachers also report they have learned more about the way their students learn within varying settings and experiences. For example, once the students had created, recorded and edited their first oral text they were all provided with opportunity to share this with a peer external to the group they had worked with in the text construction. This provided opportunity for students to share their work and peer tutor others about the iPods and the process they engaged with. One teacher described that some of the students in that class had opportunity to tutor another teacher – he describes the teacher, "helped in the conferencing part and acted as one of the children in providing feedback and asking clarifying questions".

Students were found to be articulate about the capabilities of the iPods and how they could use them to support their learning. Students were keen to use the personal on-demand aspects of the iPod when they felt the need in class, especially when assignment directions were delivered via audio file. The opportunity to listen to the directions repeatedly rather than ask multiple questions of the teacher in front of the whole class provided evidence they were adapting their learning processes to fit within the educational environment they found themselves in.

This paper provides example of how we have collaborated to incorporate iPods into classroom learning experiences. Our ongoing partnership has supported the incorporation of this technology within meaningful and authentic experiences to support student learning. In the presentation of the paper we will be able to be share further researcher observations, teacher reflection and student work product. While there are many recommendations within the literature surrounding school/university partnerships we have discovered how unique and rewarding partnerships can be.

References

Belanger, Y. (2005). *Duke University ipod first year experience final evaluation report*. Durham, North Carolina, USA: Duke University.

Cebeci, Z., & Tekdal, M. (2006). Using podcasts as audio learning objects. *Interdisciplinary Journal of Knowledge and Learning Objects,* 2, 47–57.

Clarke, M., Butler, C., Schmidt-Hansen, P., & Somerville, M. (2004). Quality assurance for distance learning: A case study at Brunel University. *British Journal of Educational Technology,* 35(1), 5–11.

Crawford, C., Smith, R., & Smith, M. (2006). *Podcasting in the learning environment: From podcasts for the learning community, towards the integration of podcasts within the elementary learning environment.* Paper presented at the Society for information technology and teacher education, Orlando, USA.

Darling-Hammond, L. (1997). *The Right to Learn: A Blueprint for Creating Schools that Work*. San Francisco: Jossey-Bass Publishers.

Dede, C. (2005). Planning for neomillennial learning styles. *Educause Quarterly,* 28(1), 7–12.

Flanagan, B., & Calandra, B. (2005). Podcasting in the classroom. *Learning and leading with technology,* 33(3), 20–25.

Hoban, G. (2002). *Teacher Learning for Educational Change*. Buckingham, UK: Open University Press.

Miller, M., & Piller, M. (2005). *Principal factors of an audio reading delivery mechanism: Evaluating educational use of the iPod.* Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications, Chesapeake, VA.

Oliver, R. (2001). Assuring the quality of online learning in Australian higher education. In M. Wallace, A. Ellis & D. Newton, (Eds.), *Proceedings of Moving Online II Conference* (pp. 222–231). Lismore: Southern Cross University.

Volery, T. (2001). Online education: an exploratory study into success factors. *Journal of Educational Computing Research*, 24(1), 77–92.

Winch, G., Johnston, R. R., Holliday, M., Ljungdahl, L. & March, P. (2001). Literacy: Reading, Writing and Children's Literature, Oxford University Press, South Melbourne.

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The role of problematizing in online knowledge building

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This paper describes an international collaboration between two classes of grade five students through an online discussion platform with one group more experienced in online knowledge building activities than the other. Using the methods of problematizing move (Koschmann yet al., 2005) and level of social construction of knowledge (Gunawardena et al, 1997), the analyses suggest that the more experienced group is better at problematizing the discourse or discovering areas of disagreement in the discussion. With the joint-discussion with the more experienced group, the discourse of the students in the novice class changed from more information-centered towards advanced levels of knowledge building.

Keywords: collaborative learning, problematizing move, online discussion, online knowledge building

Introduction

Combined with the affordance of a computer-supported collaborative learning (CSCL) environment, Scardamalia (2002) proposed a knowledge building approach which focuses on the learners' collective cognitive responsibility for the advancement of knowledge. The focus in the knowledge building approach is not on the sharing of information but the continual improvement of ideas through interactions with one another. Scardamalia (2002) proposed a total of 12 knowledge building principles, including such as "idea diversity", "improvable ideas", and "epistemic agency" that distinguish a knowledge building classroom from even the best of traditional and modern classrooms. Based on these 12 knowledge building principles, Law (2005) developed a group-level rubric to measure the advancement of knowledge building of a CSCL group. By studying a number of CSCL groups, Law (2005) identified a developmental trajectory in knowledge building, which broadly paralleled Gunawardena, Lowe, and Anderson's (1997) five phases of knowledge construction: (1) sharing/comparing of information, (2) discovery and exploration of dissonance or disagreement, (3) negotiation of meaning or knowledge co-construction, (4) testing tentative constructions, and (5) application of newly constructed knowledge. In other words, for students to become more advanced in knowledge building, they need to move from sharing or comparing information to the discovery of disagreement, negotiation of meaning and beyond.

In their paper titled, "How do people learn", Koschmann, Zemel, Conlee-Stevens, Young, Robbs, & Barnhart's (2005) studied how learning could be accomplished in inter-actional contexts. They proposed the idea of "problematizing move", which is a form of social action calling something previously held as true into doubt. A problematizing move performs two functions: directing attention to some potentially problematic matters, and at the same time, projecting some forms of collective action with regard to those matters. Koschmann et al. (2005) analyzed two learning episodes, one face-to-face and the other online, suggesting that the problematizing move could be applied in both contexts. This paper attempts to use the method of problematizing to analyze the online discourse of two groups of grade five students with one group more experienced in online knowledge building activities than the other.

Method

The research context and the online platform

This study was based on the collaboration between two primary school teachers, one in Hong Kong and the other in Toronto, Canada. The Canadian teacher is teaching at a laboratory school of the University of Toronto and has more than four years of experience in facilitating students to engage in online knowledge building activities while the Hong Kong teacher and his students were new to this novel approach. The international collaboration was set up when the two teachers met at an international conference. The Hong Kong teacher was interested in trying out this new pedagogical approach and the Canadian teacher wanted to scaffold the Hong Kong collaborators, both the teacher and his students, through online collaborative knowledge building of the two classrooms. As a result, the two teachers agreed that their students, 22 from Hong Kong and 22 from Toronto, all at grade five, would collaborate through the online platform Knowledge Forum® during the school year 2004-2005.

Knowledge Forum® (KF), the online discussion platform used in this study, was developed by Marlene Scardamalia and Carl Bereiter's team at the University of Toronto to support asynchronous collaborative knowledge building activities (Scardamalia & Bereiter, 1992). KF creates a shared network space for students to write new notes, read other's notes and respond by writing build-on notes. Notes related to the same topic could be arranged in the same view. KF has a number of specific features to support knowledge building activities. First of all, its graphical display helps users to visualize their interactions with one another as each build-on note is linked to the note it responds to. KF also provides the function of "scaffolds" in the form of word cues such as "New information", "New idea", "I need to understand", and "My theory" so that students could better organize their note contents.

Participants' backgrounds and the collaboration process

All the 22 Canadian students were from the same grade-five class in the laboratory school described above. These students had used KF as a learning environment fully integrated into their school learning experience since grade one. In fact, teachers in this school adopted not only the technology platform, but also the knowledge building approach in their pedagogical practices. While the Canadian students were experienced in knowledge building and the use of the technology platform KF, the 22 Hong Kong students were totally new to this online environment. Although they were familiar with face-to-face discussions in class, they have never engaged in online knowledge building activities approach which emphasizes the continual improvement of ideas through intentional interactions with one another. The major focus of this paper is on the differing in knowledge building experience of the two groups of students. However, it could not be ruled out that culture might play a role in this study as the two groups of students come from two different cultures; the possible effect of culture will be addressed in the discussion.

The current study began in the autumn term of 2004. As the Hong Kong (HK) students had no experience in online knowledge building activities, the two teachers agreed to start their collaboration only after the HK students had a chance to familiarize with working in KF. In Nov 2004, the 22 HK students formed five groups among themselves to work collaboratively on the online platform KF for two months to work on topics of bacteria, computer, dress-up, electric boat, and electricity. This two month period could be considered as stage one of this study in which HK students discussed among themselves on KF. At the same time, the Canadian (CA) students used KF to work on topics related to ancient civilizations which was one of their curriculum themes for the school year. No interaction of the two classes occurred during this stage.

In stage two, beginning at the end of January 2005, HK and CA students started their online collaboration. During the first week, an "Introduction" view was set up for the two classes of students to introduce themselves to each other and to articulate which topics they were interested in. Since the HK students and their teacher were also interested in ancient civilizations, the CA students extended their exploration by one and a half months to collaborate with their peers in HK on eight topics related to ancient civilizations that were found to be of interest to both classes of students. The topics included weapon, food, clothing, building, language, religion, life style, and Egypt.

The joint-collaboration ended when the CA school closed for their term-break. When school resumed in the spring term, the CA class moved on to other topics and no longer appeared on the online collaboration space with the HK students. On the other hand, the latter class of students did not have a term-break at the same time and they continued to work on the eight ancient civilization topics till June. Thus although it was not planned intentionally, the end of joint-collaboration signified the start of stage three, which could be regarded as a "fading" stage, as the more experienced group had withdrawn from the collaboration, leaving the novice group to continue the discussions by themselves.

Results

An episode of learning triggered by problematizing moves

To explore the role of problematizing in online knowledge building activities, the method of "problematizing move" proposed by Koschmann et al. (2005) was employed to analyze an episode within a discussion thread. The selected episode was within stage two, in which both the two groups of students participated in the discussion. It was related to the topic of "food". Before the problematizing move, students were discussing when ancient people changed from hunting to trading for food. A CA student posed the first problematizing move, questioning whether all ancient civilizations hunted for food. The following excerpts were extracted from the online discourse triggered by this problematizing move. The text inside brackets at the beginning of each entry denotes the scaffold selected by the student in that note.

CA student #1:	[My theory]: Is that most civilizations hunted for food? It would be interesting if a civilization did not hunt.
HK student #1:	[I need to understand]: Unless you count the tribes in Africa or India, I'm not really sure that people nowadays hunt for food. But people long time ago either hunted or farmed or even fished. But I don't know whether the people hunted more or farmed or fished more.
CA student #2:	[Further explanation]: Most civilizations found that hunting was much harder to use to get food and most civilizations were agricultural societies (farmers) and hunted only a tiny bit.
HK student #2:	I think Chinese hunted for food .Then they fished for food. Lastly they planted.
HK student #1:	[New information]: The Chinese mainly farmed for food. They think that wheat is the most important food, that's why they had so many farms in a village. The season for them to plant is spring and they harvest the food in autumn, they do not work in winter. And when sometimes they can't grow any wheat, they hunt instead.
CA student #1:	[I need to understand]: How did they get their needed meat?
CA student #2:	[New idea]: The civilizations would probably only hunt when they needed the meat and be farmers for more of the time. Maybe they even just raised their own animals like chickens and cattle.
HK student #1:	Yes, that's a good suggestion, I think it's right. I once read a book and the people usually slaughtered their own animals, they rarely hunted. That's why some people have to take care of the animals and the other are doing the farming.

As shown in the above episode, the first problematizing move drew the attention of other students to explore it further. After some negotiations of meaning, the HK students articulated that farming was the major source of food from early Chinese history, suggesting that ancient civilizations could get food from farming instead of hunting. Then the CA student posed the second problematizing move by asking how ancient people could get meat if they did not hunt. After some more negotiations of meaning, they reached the conclusion that perhaps some ancient civilizations raised animals such as chickens and cattle for meat. The selected episode seemed to suggest that the CA students, who have more experience in knowledge building activities, were better at problematizing the discourse, and those problematizing moves could trigger their HK peers to move towards negotiations of meaning and hence more advanced levels of knowledge building.

Depth of engagement in knowledge building

To look at the overall patterns changed throughout the three stages, the coding scheme of Gunawardena et al.'s (1997) five-phase model of knowledge construction was also employed to analyze all the note contents written by students. Law (2005) argued that Gunawardena et al.'s (1997) coding scheme could reflect student's advancement in knowledge building. Besides, the second phase in Gunawardena et al.'s (1997) model, namely the discovery of dissonance or disagreement, is closely related to the concept of "problematizing". Thus according to the content, each discussion note was classified as belonging to one of the five phases. Table 1 summarized the distribution of notes contributed by the students in each of the three stages in terms of the phase of knowledge construction coded on the basis of their content analysis. It could be seen that in stage one, when HK students discussed among themselves, the note contents were predominately related to sharing/comparing information (91%) and only 3% of the notes belonged to the category of negotiation of meaning and only 6% reflected the discovery of dissonance or disagreement.

In stage two, when the CA students joined in the discussions, the depth of the knowledge building discourse was noticeably changed. Results in table 1 indicate that a much higher proportion of the CA students' notes revealed discovery of dissonance (18%) and negotiation of meaning (22%), which were rarely found in the HK students' notes in stage one. In other words, compared to the discourse of HK students in stage one, CA students tended to express more disagreement or dissonance, and go deeper into the negotiation of meaning in their notes. In this joint-collaboration in stage two, HK students' notes also exhibited more advanced levels of knowledge building, especially in the negotiation of meaning (21%), while the percentage of information sharing notes dropped to 67%. Although none of the notes in the entire discourse of both classes reached the highest levels of testing tentative construction and application of newly constructed knowledge, the HK students made a significant progress in knowledge building during this stage. It appears that the discourse of the CA students triggered their HK peers to advance in their level of knowledge building engagement.

Table 1: Classification of students' note contents in each of the three stages using Gunawardena et al.'s (1997) five-phase coding scheme

	Stage 1	Stage 2		Stage 3
	HK	HK	CA	HK
Phase 1: Sharing/comparing information	91%	67%	60%	81%
Phase 2: Discovery of dissonance	6%	13%	18%	5%
Phase 3: Negotiation of meaning	3%	21%	22%	14%
Phase 4: Testing tentative constructions	0%	0%	0%	0%
Phase 5: Application of newly constructed knowledge	0%	0%	0%	0%

In stage three, after the CA students withdrew from the online discussion, the distribution of the HK students' changed yet again. The percentage of notes devoted to the negotiation of meaning remained high (14%), although there was a drop from 21% in stage two. On the other hand, the percentage of notes reflecting discovery of dissonance dropped drastically to 5%, while the percentage of information sharing notes moved up to 81%, though this was still lower than the figure of 91% in stage one. It appears that without the disagreeing discourse contributed by the CA students, the level of dissonance became lower at this stage. Although the HK students could still engage in negotiation of meanings among themselves, the negotiation became gentler and the level of conflict was low. The HK students reverted back to more information seeking and sharing behavior at this stage.

Discussion

The findings seemed to suggest that with more experience in knowledge building activities, CA students are better at problematizing the discussion. However, another possible explanation is culture. The two groups of students were from two different cultures, one Eastern and one Western. There have been findings that people from Eastern cultures, which are more collectivist, tend to conform and agree more; while people from Western cultures, which are more individualistic, tend to deviate and disagree more (see e.g., Nisbett, 2003). The finding that Canadian students tended to express more disagreements in their discourse might reflect a cultural difference rather than a consequence of differential knowledge building experience between the students. Further studies are needed to separate the effects of culture from knowledge building experience. As the current study finds that discovering dissonance or disagreement is an important step toward advanced levels of knowledge building, it is useful to explore whether culture alone could trigger a high level of disagreement.

The findings of this study suggest that the discovery of disagreement is closely related to the concept of problematizing move (Koschmann et al., 2005). Further studies are needed to understand how these may be related. For example, can all types of disagreement serve the same problematizing function? Are there problematizing moves that do not involve disagreements? Could there be consonant and dissonant problematizing moves? Does the presence of scaffolds such as "I need to understand" provided in KF have any impact on the problematizing moves or the discovery of dissonance? Are the scaffolds useful in triggering problematizing moves? Pea (2004) summarized two major mechanisms of scaffolding: channeling/focusing and modeling. Channeling/focusing is closely related to "problematizing" as they both involve directing attention towards certain issues. The results of this study suggested that as a more experienced group in knowledge building, the Canadian students are better at problematizing the discourse, which in turns could scaffold a novice group towards more advanced levels of knowledge building.

References

Gunawardena, C. N., Lowe, C. A., & Anderson, T. (1997). Analysis of global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research,* 17(4), 397–431.

Koschmann, T., Zemel, A., Conlee-Stevens, M., Young, N., Robbs, J., & Barnhart, A. (2005). How do people learn? Members' methods and communicative mediation. In R. Bromme, F. W. Hesse, & H. Spada (Eds.), *Barriers and biases in computer-mediated knowledge communication – and how they may be overcome* (pp. 265–294). NY: Springer.

Law, N. (2005). Assessing learning outcomes in CSCL settings. A paper presented at the CSCL conference 2005. May 30–Jun 4, Taiwan.

Nisbett, R. E. (2003). *The geography of thought: How Asians and Westerners think differently and why*. New York: Free Press.

Pea, R. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. *The Journal of the Learning Sciences,* 13(3), 423–451.

Scardamalia, M. (2002). Collective cognitive responsibility for the advancement of knowledge. In B. Smith (Ed.), *Liberal education in a knowledge society* (pp. 67–98). Chicago: Open Court.

Scardamalia, M., & Bereiter, C. (1992). An architecture for collaborative knowledge building. In E. De Corte (Ed.), *Computer-based learning environments and problem solving* (Vol. 84, pp. 41–66). Berlin: Springer-Verlag.

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Monitoring eLearning environments through analysing web logs of institution-wide eLearning platforms

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Monitoring the use of web technology in teaching and learning activities at an institutional level can provide universities with valuable data to guide policy decision-making for eLearning support services. Like many other universities, The Chinese University of Hong Kong has centralized support to teachers and students through the provision of eLearning platforms, and training and educational advice on eLearning strategies. The paper examines how the logs kept in the centralized platforms support the University in monitoring eLearning at an institutional level. The logs provide information on three common areas of interest concerning web use: its popularity, nature of use and the engagement of the participants. The paper also illustrates, with data from the University, the analysis and reporting that can be done with the logs to enrich our understanding of the University's eLearning in these three areas.

Keywords: eLearning, institutional level, monitoring, platforms, logs, staff development

Tracking eLearning at an institutional level

Institution-level policy relating to eLearning is essential in promoting meaningful use of web-enhanced teaching and learning. There have been some studies at programme level, university level or involving several universities conducted with the aim of maximizing the potential benefits of web-enhanced teaching and learning. Two studies in New Zealand and one in Australia are noted below. In a recent (2004) study of a single university in New Zealand, Northover (2005) examined the perspectives of administrators, teachers and students. For all three groups (albeit in different words and with different nuances), the success of the eLearning system depended upon whether these three factors were met (in no particular order): (i) expectations about flexibility and technical access; (ii) the quality of the learning experience; and (iii) processes for managing work and other aspects of life. Marshall (2005) reported on overall eLearning capabilities using data from six universities and three polytechnics in New Zealand. He revealed institutional weaknesses in the areas of performance in learning, development, coordination and evaluation aspects of eLearning. For example, the eLearning development did not match the desired educational outcomes; evaluation processes were also lacking. McNaught, Phillips, Rossiter and Winn (2000), in an Australia-wide study involving 25 universities in all states of Australia, found that the issues surrounding the adoption of eLearning at universities are complex, and no single factor will result in adoption. They identified an interlocking set of factors relating to issues in institutional culture, policy and support. These studies all reveal the complex and multifaceted nature of eLearning policy and support, and establish the need for information, coordination and consultation when developing policy.

The work in this paper is a consequence of a study conducted in 2004 at The Chinese University of Hong Kong (CUHK) (McNaught, Lam, Keing, & Cheng, 2006) aimed at obtaining a clear picture about the use of eLearning in the University so as to develop new strategic directions on a firm evidence base. CUHK is a comprehensive, research-intensive university with seven faculties serving 10 000 undergraduate and 9 000 postgraduate students. The study was successful in obtaining significant funding for the provision of an enlarged eLearning support service. One of the reasons for this paper is to offer this evidence-based approach to other universities as a possible persuasive strategy.

A university-wide investigation of eLearning activities is difficult as there is a great variety of eLearning activities occurring in any university, involving a range of strategies, and diversity in arrangements for hosting materials and systems. A full understanding of an eLearning situation requires measurements across many aspects. Frydenberg (2002) described standards in nine domains which can determine the quality of eLearning in an institution. They are:

1 Executive commitment
2 Technological infrastructure
3 Student services
4 *Design and development*
5 Instruction and instructor services
6 *Programme delivery*
7 Financial health
8 Legal and regulatory requirements
9 Program evaluation

Frydenberg focused on considerations for distance education settings, but there are similar concerns in all universities that are seriously utilizing technology to supplement face-to-face teaching. Among these nine aspects, we would argue that the standards in *design and development*, and *programme delivery* are universally important as they are directly related to the nature of the online activities students are engaged in, and hence also to the level of engagement they have in the activities. A key element of good design and delivery involves the concept of interactivity – how students interact with learning materials, with the teacher and with peer learners (Swan, 2003). Online interactivity involves interactions with either the content which might be text, audio visual resources, graphics and static visual representations, scenarios, simulations, and/or quizzes, or with people via asynchronous online communication (threaded discussions/ newsgroups) and/or synchronous communication (chat) (Kearsley, 2000). Interactivity is thought to enhance learning as feedback and reflections effectively help the construction of meaning and give structure to knowledge and information (O'Connor, 1998; Taylor & Maor, 2000). Other writers have emphasized the interactions among the peers in the form of learning communities. Both Laurillard (2002) and Wenger (1998) discussed how 'communities of practice' can emerge through the use of web technology. In these communities learners can pursue shared enterprises through discussion and collaboration in a highly active form of learning.

In line with this constructivist view of eLearning designs, evidence of rich teaching and learning resources, and meaningful interactions (both teacher–student and student–student) between computer users are effective indicators of good online development and programme delivery.

Logs as sustainable and non-intrusive evaluation data

Evidence about the richness of online resources and the nature of online interactions can be collected through various means. For example, Brown, Doughty, Draper, Henderson, and McAteer (1996) measured students' engagement in various online activities in multiple courses using students' self-reflections. However, this data is costly to gather in terms of time. This paper proposes a strategy by which logs of eLearning activities in centralized university units provide a relatively easy method for the evaluation of the richness of eLearning resources and interactions. The logs should be understood in a "general way" as any kind of information "saved into a file or only kept in a memory while an application is used" and the information can be about usage, user activities, problem situations, and user-related metadata (Rahkila & Karjalainen, 1999). Rahkila and Karjalainen argued that logs are useful tools for teachers to use at a course level to understand student learning. Silva and Vieira (2002) went further and suggested that logs can serve as a basis for ongoing assessment of students. We suggest that logs are of value at an institutional level. Effective record-keeping, and extraction and interpretation of eLearning logs can reveal valuable information on the standards of design and development, and programme delivery. The logs can reveal information about the magnitude and the nature of the online learning content and the online activities. This strategy is not intended to be a comprehensive solution to all evaluation needs but it is a comparatively easy, automatic, and non-intrusive method to provide relatively quick and accurate data to help answer some questions and concerns. The work is an extension and consolidation of the 2004 study to monitor eLearning in our University (McNaught et al., 2006).

The logs kept by the common learning management systems are not immediately useful for this level of use because "the visualisation of data is insufficient or absent" and "these data are usually oriented toward the instructor's view" (Solodovņikova & Niedrīte, 2005, p. 234). Solodovņikova and Niedrīte described the mechanism needed to extract and mine log data in WebCT. The focus of the present paper, however, is not the same. We are not concerned with the technical aspects of data mining, but are interested in educational questions such as: What data types are actually available through the logs and what information can this data provide to further our understanding of eLearning activities?

In universities with centralized web-based teaching and learning systems, monitoring the logs can be accomplished because most eLearning platforms have in-built mechanisms to track and record a certain amount of information about online activities occurring within the systems. This is the situation at CUHK. The Information Technology Services Centre (ITSC) is responsible for maintaining the eLearning platforms for teaching staff in the University. The Centre also provides consultation and training for teachers to familiarize them with the functionality of the platforms and support the development of simple eLearning materials. Two main platforms are supported at CUHK. These are WebCT and a home-grown platform, CUForum (see http://www.cuhk.edu.hk/elearning). The main difference between WebCT and CUForum is that CUForum does not support online quizzes. There is support provided for other web-based teaching, including a real-time virtual classroom (iClass) and on-demand lectures. Moodle is now supported as a new initiative. However at this time, the majority of CUHK teachers who use ITSC's services use WebCT or CUForum.

The Centre for Learning Enhancement and Research (CLEAR) is also responsible for supporting pedagogical aspects of eLearning. Teachers receive advice on how to choose and implement appropriate eLearning strategies for the specific teaching and learning needs of different courses.

At CUHK the majority of the eLearning activities are supported by the central services. Apart from one faculty (Engineering) there are few non-centrally-hosted course websites. For this reason our monitoring model concentrates on the learning activities that are recorded in the centralized platforms only.

System logs recorded in centralized eLearning platforms can provide data on the popularity, the nature of the functions/ strategies in use, and engagement of teachers and students. Extraction of system logs is also completely non-intrusive to both teachers and students. The 2004 study provided us with good experience in extracting and interpreting logs. The experience led to rethinking our processes into a more organized framework. Once the software for log extraction and analysis is in place, the examination of log data can be administered on a regular basis (e.g. annually). In the long run, the monitoring mechanism can produce an eLearning report each year, and also enable trends in different areas of eLearning use to be examined over time.

One limitation of this approach is that it monitors only uses of the web that utilize the central system. Also, it has a bias on quantity rather than quality as logs focus on numbers rather than providing a full picture of the educational quality of the course websites. The exact activities that are ongoing are not transparent in a log mechanism for two reasons. Firstly, staff in central units have no rights to access the content and messages on course websites without proper authorization. Further, not all online activities and the engagement of these activities can be effectively recorded by the logs. For example, the availability of course outlines on course websites is an online activity that is of great interest to our University. However, having an online course outline is not an activity separately recorded by the logs of either WebCT or CUForum. It is impossible to identify unless researchers go into the individual websites and read all the documents there because course outlines can be any of the uploaded files. Also, the idea of tracking the engagement of teaching assistants in forum discussions is not practical in the CUForum platform as teaching assistants are not assigned special roles in the system at present. The picture portrayed by the logs can only be a partial representation of the total learning activities, and the engagement teachers and students have with these activities.

Secondly, a detailed study of quality is too time-consuming for a largely automatic and regular eLearning monitoring mechanism. There is a tension between practicality and maximum usefulness that we needed to negotiate, and we have sought a good balance point. Of course, issues of quality and usefulness are vital. The data provided by the log system complements a number of other projects at CUHK which are designed to provide feedback to individual departments and course teachers.

The monitoring mechanism was also restricted by technical limitations. The eLearning platforms do not normally provide institutional level data; they are mainly intended for individual teachers to monitor their students but not for the institution to monitor all courses at the same time. Our two eLearning platforms were WebCT version 3.8 and CUForum. WebCT does not supply detailed documentation on database structure and definitions, making the locations where log records are stored in the system difficult to access outside of the in-built logs display. As a result, much time and effort were spent on: (i) testing where to allocate the intended information through trial and error; (ii) checking whether the data are accurate; and (iii) developing software to enable automatic extraction of the information on all courses in the University. Six months were spent on this aspect of our work.

Since the other main eLearning platform of the university, CUForum, is a home-grown platform, the places where activities records are stored in system are more transparent. However, we still met challenges such the fact that these figures were originally intended to assist individual teachers only and not for reporting university-wide uses. Minor changes had to be made to extract the appropriate logs from the system and do the respective calculations. One month was spent on this process.

The questions logs can answer

Logs can provide three types of information to support our understanding of eLearning uses:

1. The notion of **popularity**. We define this as a general notion concerning whether any forms of eLearning activities exist in a course. This is a very simple yes/no specification to each course in the University, whether any sorts of eLearning activities are recorded in our logs or not.
2. The **nature** of the eLearning activities recorded for each web-enabled course. For example, this means whether there are forums, assignment submission service, course content delivery function, online quizzes or surveys, and grade book facility, etc.
3. The **engagement** notion which reflects how involved teachers and/or students are in these activities. This is the level among the three that conveys the finest amount of detail about a site. After the recognition that there is a course website (popularity), more information can reveal the actual features and activities having occurred on the site (nature). After learning about the nature of the website, yet more information can be collected to see to what extent the teachers and students have been engaged in the various types of activities (engagement).

Even if the logs are available to reveal certain aspects of popularity, nature and engagement of the websites, care has still to be taken to understand the exact meanings of these logs based on the characteristics of the platforms and how logs are kept in them. Very often, minor adjustments have to be made or there are decisions to make concerning the cut-off points beyond which the records are deemed to fall into another category.

Details of the log data collected

Different types of site log data were collected for the current study. All of them were obtained by additional programming by ITSC.

Popularity: Whether the platforms are used

The existence of an online component for courses that use WebCT is comparatively easier to determine than those using CUForum in our case. WebCT users have to register for their WebCT courses at the beginning of every new academic year. Existence of WebCT courses is defined as all the registered courses in the period under study (e.g. academic year 2005–06). The situation in CUForum is comparatively more complicated because all opened forums are automatically carried on to the next term without the need to re-register. The definition of a site that exists in CUForum in a particular academic year is therefore defined as an ‘active’ site which has at least ONE access during a pre-determined period of time (usually from the beginning to the end of the studied academic year).

Another interesting decision concerning the notion of popularity concerns the size of a class. Past experience has informed us that class size is a major factor affecting teachers' willingness to use an online component. In general, teachers have less motivation to use the web when the class is small (say fewer than 10 students). The decision we have is to extract, as part of the data, the number of active students in each course (all students in the course minus the 'denied access' ones in WebCT).

Nature: The functions and strategies being used

Two main types of system records inform us about the types of learning activities that are likely to be ongoing in the eLearning platforms. The first type is about the web functions that are opened or are in use by the teachers, and the second type concerns checking the file-types that are associated with the websites (Table 1).

Table 1: Data available from logs about the nature of use

	WebCT		**CUForum**	
Functions	• Forum (discussion) • Assignment submission	• Content delivery • Quizzes / survey • Grade book • Chatroom	• Message (discussion) • Homework (Assignment submission)	• File • Links • Photos
File types (and number of files)	• doc • pdf • xls • ppt • swf	• htm/ html • Media files such as ram, rm, wma, wmv, mp3, mpeg, avi	• doc • pdf • xls • ppt • swf	• htm/ .html • Media files such as ram, rm, wma, wmv, mp3, mpeg, avi

When the web functions present on websites are recorded, there are a number of factors to consider. First, there is no need to check every function. For example, the email and the calendar functions in the WebCT platform may not be worth checking. Students and teachers are likely to use other email systems and other means to display course calendars, such as an uploaded plain Word document. It is therefore difficult to judge the presence or absence of such activities based on logs alone. This in turn makes the pedagogical value of such data minimal.

Some functions are set to be default components on websites. For example, all functions in CUForum already exist by default and so whether the functions are actually used or not cannot be decided by the simple existence of such features. Checking of basic WebCT functions such as forums and quiz also requires additional attention. Default functions that recorded zero usage are not included as valid active components; however, this rule requires some additional consideration. Consider the quiz function in WebCT as an example. There is a default quiz (called 'sample quiz') upon a site's initiation; a teacher can delete this before building her/his own quiz, making the internal counter for the total number of quizzes present on the website to remain as 'one'. So, the number of quizzes on a website in itself is not an accurate indicator of the function in use. While a record of only one quiz on the website in most cases means the function is inactive because it is the 'sample quiz', in some cases it may mean the website has a teacher-written quiz with the sample quiz deleted. A more complicated logic has to be used. The name of quiz can be added to the consideration: Do not count quiz with name 'sample quiz'.

Functions in WebCT that are monitored in the mechanism include the 'forum', 'assignment submission', 'content delivery', 'quizzes/ survey' and 'grade book'. CUForum does not support online quizzes, but rather it has separate folders for users to put up interesting links and images respectively. The functions that are of interest in the monitoring mechanism are 'message', 'homework', 'file', 'links' and 'photos'.

A record of file-types uploaded to WebCT and CUForum can be extracted. Through our tailor-made extraction and logs analysis program, the files in the record can be further classified into file-types: e.g. doc, pdf, xls, ppt, swf, htm/ html, and media files such as ram, rm, wma, wmv, mp3, mpeg and avi. A decision has to be taken as to whether to read all files stored on the sites, only the files released to students, or even only those files that have been viewed by students. The information about what files are on the site is another source of information, which indirectly and roughly indicates some characteristics of the sites: e.g. content-rich or media-rich.

Engagement: Involvement of teachers and students in the activities

Many types of logs inform us of the level of engagement of teachers and/or students in the online activities. As shown on Table 2, such information comes from the records of the traffic incurred in the whole platform, the visits paid to individual sites through counters on the first page, the record of attempts by students in quizzes, the logs on reading and writing postings in forums, and the frequency of files being viewed and downloaded. We did not define traffic as the volume of information (in bytes) going in and out the systems as it is greatly influenced by the size of the files and whether a multimedia format has been used. The tracking is based on the frequency of access by students and by teachers to the platforms in general. There is a time stamp for each record so that analyses of the traffic by month, by week, by day of week, and by hours are all possible.

Table 2: Data available from logs about engagement

	WebCT		CUForum	
Traffic	• Frequency	• By week/ month	No data	
Visits	• Counter on first page		• By students (% of non-users)	
Quizzes	*Single-attempt quizzes* • No. of exercises • No. of questions • % of students attempted • No. of quizzes with feedback	*Multiple-attempt quizzes* • No. of exercises • No. of questions • % of students attempted • No. of attempts per students • No. of quizzes with feedback	Not applicable	
Forum	• No. of posts • Post (written and read) per student	• Range of postings (written and read) by students	• Posts by teachers • No. of threads	• Thread length
File viewing	• Viewing	• Downloading	• Viewing	• Downloading

There are internal counter systems in both WebCT and CUForum which basically record visits paid to the first pages of individual websites. The main disadvantage of these counters is that they do not record teacher activities since the original purpose of them is to assist teachers in tracking students. The extraction and monitoring program added to the WebCT and CUForum systems reads all raw data concerning the visits paid by individual students to sort out the average visit per student, and also the range of the frequency of visits. The analysis can also highlight the number of 'students who never logged in' in the whole student population when we look across records of visits across all sites. It is a useful piece of information. However, we need to be careful as some of these students may be students who had been denied access (a possibility in WebCT) perhaps because they have dropped the course.

There are two main types of quizzes. In the first type students are allowed to make one attempt. This is more likely to function as formal assessment in the course. The second type permits students to make multiple attempts and allow students to learn through their errors. Such quizzes may be self-assessment exercises for students with marks not contributing to course grades. In both types, the percentage of students who have taken the quizzes can be calculated. In the multiple-attempts-allowed quizzes alone, the average number of attempts made by students can be calculated by either dividing the total attempts recorded on all quizzes by the total number of students in class, or by dividing the total attempts on quizzes by the number of students who have taken any quizzes. The logs can also reveal the number of quizzes that have pre-installed feedback.

Both the forums in WebCT and CUForum arrange the postings in threads. Logs can be extracted to reveal the number of the total postings on the forums, the average number of postings written per student, the number of postings read by students, the range of the number of postings written by different students, the number of postings by teachers, the number of threads, and the average thread length.

Lastly, the frequency of students' viewing of uploaded content on the websites also reveals how students have been engaged in the online activities. Checking the 'visits of files' is easy in CUForum. There is already a function that records the usage of the files by individual students. The original purpose of the function is to allow teachers to monitor their classes. The information can be collected for all classes in our monitoring mechanism. The 'visits of files' data in WebCT are comparatively difficult to collect. First of all, the system does not count visits on all the files; it only checks those files stored under the 'course content' page. If the files are attachments in forum postings, for example, the system will have no records of them. Secondly, it is more difficult to find the information from these counters in the system as the system does not provide clear information on the database structure for data. We have to acknowledge these limitations when we read the WebCT data.

Reporting

The data from the logs enable, but are not restricted only to, the following types of data comparison and representations. Concerning the question about popularity (whether eLearning is used in the university), we can look at the overall usage of the platforms. For example, the trend of the overall websites built on the WebCT and the CUForum platforms can be calculated and contrasted across the years. Figure 1 illustrates the trend in the operating figures of WebCT and CUForum at CUHK using data from 2000–06.

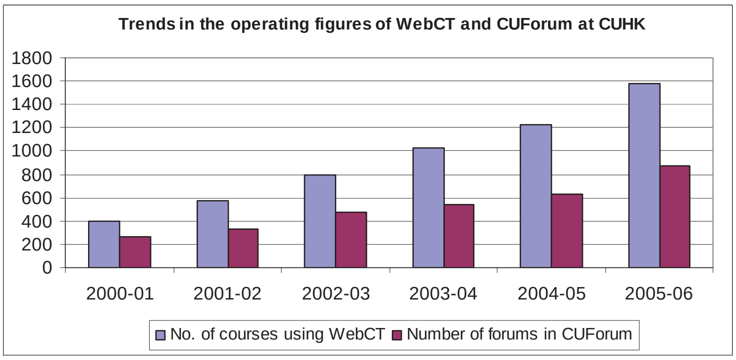

Figure 1: Trends in the operating figures of WebCT and CUForum at CUHK

The popularity of courses that have a web component in either WebCT or CUForum can also be calculated for each of the faculties or departments in the University. Faculties and departments vary a great deal in their eLearning environment. For example, on the one hand, there are eLearning-intensive faculties in which more than 95% of courses have an eLearning component. On the other hand, there are faculties in which teachers less regularly engage their students in online activities; web-enabled courses reach as low as 20% of the total number of courses.

Concerning the second question about the nature of the online activities on the sites, logs concerning the features and functions used can be compared and contrasted. Figure 2 illustrates with data for 2005–06 the various levels of employment of the following functions in WebCT: the quiz, assignment submission and discussion functions.

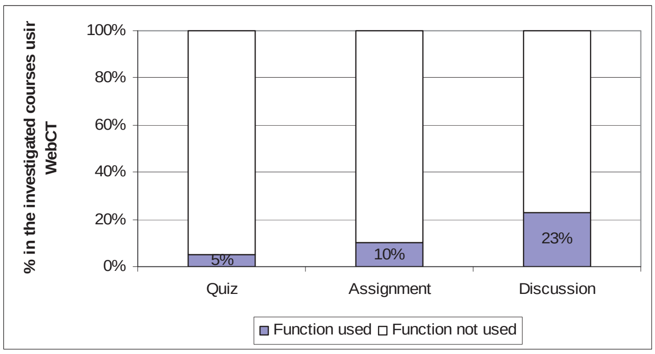

Figure 2: Web functions in the websites hosted in WebCT (2005–06)

The individual functions can be analysed individually. For example, Figure 3 illustrates some details about how the quiz function is used in WebCT using also the 2005–06 data. Recalling that most of the websites do not have any quizzes (95% from the readings on Figure 2), teachers who use the quiz functions, can use the function quite intensively. There are cases where there are more than 10 and even more than 20 quizzes.

Lastly, concerning the question about whether students are engaged in eLearning tasks, logs about student activities can be studied closely. Figure 4 illustrates one way to analyse the level of engagement of students in discussion forums. Higher level of engagement is revealed by the average number of postings made by students in WebCT forums. The 2005–06 data show that most students either have not participated at all or have posted only one to three messages in average in each course.

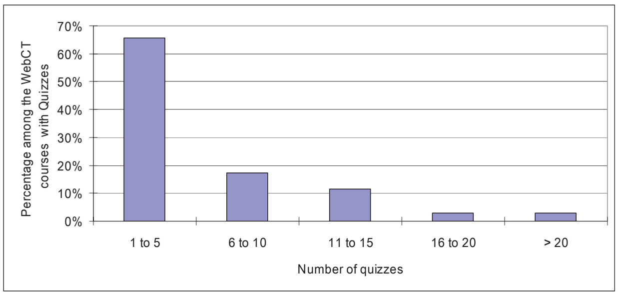

Figure 3: Use of the quiz function in WebCT websites (2005–06)

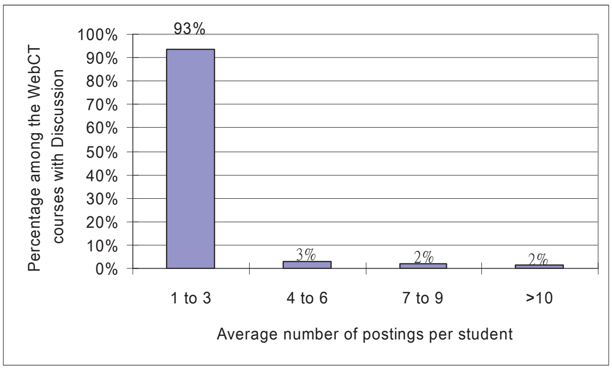

Figure 4: Average number of postings made by students in WebCT forums (2005–06)

Other possibilities of analyses and reporting on this level include investigation of the eLearning readiness of students by looking at students' visits to each course website over the year, the engagement of students in other functions of the websites, e.g. quizzes and content-viewing, the engagement of teachers in viewing the sites, and participating in forums. The information of engagement in eLearning can also be contrasted between the different faculties, departments and programmes. The information can also show a trend if the data are recorded over time.

Interpretation

The processed data can lead us to a better understanding of the eLearning from at least three different angles. First of all, the data provides an overview of the use made of the web within the institution and across different faculties. In the case of CUHK, eLearning is still largely in the 'innovators' and 'early adopters' stages (Rogers, 2003). ELearning is still far from a popular teaching and learning strategy at the University. Also, content provision and discussion are the most widely used functions. Sites seem to be largely 'static' rather than 'interactive' as suggested by the logs that record forum usage and the number of multimedia files on sites. Other features of the eLearning platforms, such as the online quizzes and assignment submission functions, are rarely used.

Secondly, the data make comparison across disciplines possible. In the case of CUHK, for example, the use of eLearning across faculties varies a great deal (from nearly all courses to about 20% of courses). We do need to be careful in reading these numbers. In the Faculty of Engineering, for example, even though ITSC-hosted platforms are not widely used for eLearning activities, teachers are engaged in extensive use of the web in teaching using their own servers. Follow-up communications with selected members in this faculty confirmed that they found setting up online learning resources and activities by doing their own programming is in fact more time-efficient and flexible than using the eLearning platforms intended for teachers with limited computer literacy. Teachers in this faculty are more able computer users.

Knowing the faculty characteristics of engagement in eLearning is important for more focused planning for eLearning support and promotional strategies. For example, we have decided to concentrate on the more sophisticated functions of the platforms when we approach the Faculty of Medicine as the content delivery and forum functions are already commonly used. On the contrary, the basic functions will be the main focus when we approach the faculties that are less ready. We also see the necessity of motivating the teachers in faculties with low usage to use the technology. In this case we will concentrate on how the technology can provide convenience and better information (what we call level 1 in our eLearning guidelines; see http://www.cuhk.edu.hk/eLearning/doc/eL_Guidelines_6Mar06.pdf) and hence perhaps support student learning. However, in the Faculty of Engineering, the focus will be on pedagogy rather than on technology. They will be given illustrations that illustrate the great variety of online learning activities and designs that may lead to improved learning and teaching.

The third angle of interpretation the data supports is the monitoring of progress over time. The repeated measures of the same eLearning activities over the years should portray a dynamic picture that highlights changes and trends in eLearning. It is more valid and more positive to depend on the information collected over the years to acknowledge disciplines' effort in making progress in a direction that suits their purposes. For example, the progress of the less ready faculties will be to a large extent reflected by the number of newcomers to the eLearning platforms over the years. The progress of the others, however, will be more focused on the enhancements on their eLearning strategies and designs.

The information on the current web uses, and the trends and changes of web activities over the years, undoubtedly directs the focuses of the eLearning support provided by the institution. In CUHK, the monitoring mechanism was germane to the design of the University's new eLearning Service (eLS@CU). eLS@CU was based on the findings of the extensive evaluation study in 2004 of course websites in all seven faculties at CUHK. The objectives are to provide focused professional development for teachers about the strengths, weaknesses, potential, and strategies for eLearning; and support for individual teachers and course teams, in both educational and technical matters on individual course websites. Each of the CUHK's 54 undergraduate programmes has been approached. Over a period of two years (2005–06 and 2006–07) a plan will be produced for each one about how best to support enhancement of eLearning within all, or a targeted selection of, courses.

Conclusion

Using the case of CUHK, the paper has outlined how logs can be exploited systematically to reveal valuable information about eLearning at the institutional level to inform decision-making about policy matters, including funding for eLearning support services. Now that it is in place, the monitoring mechanism provides a non-intrusive and labour-friendly strategy to record information about web-based teaching and learning activities by collecting and analysing the logs recorded in the centrally supported eLearning platforms. The logs can provide information on three common areas of interest concerning web use: its popularity, nature of use and the engagement of the participants. The paper also illustrates, with real data from the University, the sorts of analysis and reporting that can be done with the logs to enrich our understanding of the University's eLearning. Possible outcomes of such analyses include better understanding of the current uses which in turn can inform new plans and decisions on future eLearning support. The paper also emphasizes the limitations of the mechanism – its measures are based more on quantity than quality; and needs to be supplemented by other detailed (and often qualitative) eLearning studies on the usefulness of various web strategies.

The monitoring mechanism portrayed is not necessarily based on any particular eLearning platform. The framework about the basic approach can generally be answered by logs recorded in most eLearning platforms. The study shows one application of the framework by illustrating what types of logs can be extracted from WebCT and CUForum. However, a similar extraction, analysis and interpretation of logs is equally possible in other platforms as long as there are ready-made functions in these platforms to record activities, or the platforms easily allow add-ons to track activities. It is hoped that this paper will be of interest to other universities where detailed institution-level tracking has not yet been established.

References

Brown, M. I.., Doughty, G. F., Draper, S. W., Henderson, F. P., & McAteer, E. (1996). Measuring learning resource use. *Computers Education*, 27(2), 103–113.

Frydenberg, J. (2002). Quality standards in e-learning: A matrix of analysis. *The International Review of Research in Open and Distance Learning*, 3(2), 4-11, http://www.irrodl.org/index.php/irrodl/article/view/109/189 [viewed 12 Oct 2006].

Kearsley, G. (2000). *Online education: Learning and teaching in cyber-space*. Belmont, CA: Wadsworth/Thomson Learning.

Laurillard, D. (2002). *Rethinking university teaching: A framework for the effective use of educational technology* (2nd Ed.). London: Routledge.

Marshall, S. (2005). *Report on the e-learning maturity model evaluation of the New Zealand tertiary sector*. University Teaching Development Centre: Victoria University of Wellington, http://www.utdc.vuw.ac.nz/research/emm/documents/SectorReport.pdf [viewed 12 Oct 2006].

McNaught, C., Lam, P., Keing, C., & Cheng, K. F. (2006). Improving eLearning support and infrastructure: An evidence-based approach. In J. O'Donoghue (Ed.), *Technology supported learning and teaching: A staff perspective* (pp. 70–89). Hershey, PA: Idea Group Inc.

McNaught, C., Phillips, P., Rossiter, D., & Winn, J. (2000). *Developing a framework for a usable and useful inventory of computer-facilitated learning and support materials in Australian universities*. Evaluations and Investigations Program report 99/11. Canberra: Higher Education Division Department of Employment, Education, Training and Youth Affairs. http://www.dest.gov.au/highered/eippubs1999.htm [viewed 12 Oct 2006].

Northover, M. (2005). *An investigation into the complexity of some pedagogical and administrative factors in the implementation of an e-learning system*. Unpublished thesis for the degree of Master of Computing. Unitec: New Zealand.

O'Connor, M. C. (1998). Can we trace the efficacy of social constructivism? *Review of Educational Research*, 23, 25–71.

Rahkila, M., & Karjalainen, M. (1999). Evaluation of learning in computer based education using log systems. In *Proceedings of 29th ASEE/IEEE Frontiers in Education Conference (FIE'99).* (pp. 16–22). San Juan, Puerto Rico. http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=839266 [viewed 12 Oct 2006].

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Silva, D. R., & Vieira, M. T. P. (2002). Using data warehouse and data mining resources for ongoing assessment of distance learning. In P. Kommers, V. Petrushin, X. Kinshuk & I. Galeev (Eds.), *ICALT 2002* (pp. 40–45). Proceedings of the IEEE International Conference on Advanced Learning Technologies, Kazan, Tatarstan, Russia. http://lttf.ieee.org/icalt2002/proceedings/t107_icalt140_End.pdf [viewed 12 Oct 2006]

Solodovņikova, D., & Niedrīte, L. (2005). Using data warehouse resources for assessment of e-learning influence on university processes. In J. Eder, H-M. Haav, A. Halja & J. Penjam (Eds), *ADBIS'2005* (pp. 233–248.). Communications of the Ninth East-European Conference on Advances in Databases and Information Systems, Tallinn, ESTONIA, http://ftp.informatik.rwth-aachen.de/Publications/CEUR-WS/Vol-152/paper15.pdf [viewed 12 Oct 2006].

Swan, K. (2003) Learning effectiveness online: What the research tells us. In J. Bourne and J. C. Moore (Eds), *Elements of quality online education: Practice and direction* (pp. 13–46). Vol. 4, Sloan-C series. Olin Way, Needham, MA: The Sloan Consortium.

Taylor, P., & Maor, D. (2000). Assessing the efficacy of online teaching with the Constructivist On-Line Learning Environment Survey. *Teaching and Learning Forum 2000.* http://lsn.curtin.edu.au/tlf/tlf2000/taylor.html [viewed 12 Oct 2006].

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge: Cambridge University Press.

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Moving towards a university-wide implementation of an ePortfolio tool

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The University of Wollongong has been strategically exploring ePortfolios since 2002. Building on lessons learnt from student trials across two different disciplines in 2002/3 and 2006, the project team is on the verge of implementing a university-wide ePortfolio tool customisable for all students across all faculties. This paper describes the steps taken on the road thus far, including a description and justification of a new project structure and consultative framework developed to guide the implementation.

Keywords: ePortfolios, cultural change, consultative framework, curriculum integration

Introduction

In recent years electronic portfolios (also known as ePortfolios) of student work have become more popular, taking over from paper-based versions (Avraamidou & Zembal-Saul, 2006). Benefits include better educational outcomes afforded by the ability to annotate and contextualise items in the portfolio, as well as the ability to cut and paste text into other applications for a multitude of purposes.

The University of Wollongong (UoW) has been strategically exploring ePortfolios since 2002 with student trials in 2002/3 and 2006. ePortfolios facilitate reflection, recording and articulation of the university experience and hence have connections to our capacity (as the Australian University Quality Audit recommends) to "embed the Graduate Attributes into the curriculum and into teaching and assessment practices" as well as draw on the individual's whole of life experiences outside the curriculum. In addition, some accrediting bodies, such as the NSW Institute of Teachers and the Australian Medical Association, have made it compulsory for graduating students to show evidence of learning outcomes against complex sets of over 40 Professional Skills criteria.

In December 2005 it was proposed to make available a university-wide ePortfolio system, based on ePortfolio trials conducted in 2002/03 and 2006. While a generic ePortfolio may be made available to all students in the future, the first priority will be to integrate the UoW ePortfolio into academic programs of study, with cohorts of students having a discipline-specific and customised ePortfolio made available to them after negotiation with Faculties.

Portfolios and ePortfolios: A literature review

Research into portfolios for student learning and assessment has been going on for over 25 years (Barrett, 2003). From an educational perspective, portfolios provide a mechanism to encourage student reflection which has the potential to assist with students' understanding of their own learning.

Unlike a static, paper-based portfolio, an ePortfolio allows information to be stored, accessed, updated and presented in various electronic and paper-based formats (Song et al., 2004). ePortfolios can take a number of forms, but at their core is the facility to enable students to store and update records of their achievements both in terms of the development of discipline-specific skills and the acquisition of broader Graduate Attributes (Luca et al., 2003). Reflections, self-evaluation and personal development are central themes to ePortfolio development with the emphasis of most ePortfolio implementations being on helping students to understand their own personal development and identify areas where improvement is needed (DiBiase, 2002). The features of the UoW ePortfolio are in line with these trends, focussing on:

1 skills development including Graduate Attributes
2 recording achievements, and
3 personal development.

Barrett (2001) identifies three general purposes of ePortfolios in educational settings. Learning ePortfolios are formative in nature and focus on personal development through the use of self-evaluation and reflection. ePortfolios can also be used as a tool of assessment where students are required to show, through selection and reflection on their learning activities, how skills and knowledge development have been demonstrated. The third general purpose of ePortfolios is focused on the presentation of skills and attributes for employment contexts.

The push for the implementation of ePortfolios can often come from multiple arenas within an institution (Reardon et al., 2005) and can also come from national or governmental organisations (Ravet, 2005). At the University of Wollongong two main driving forces are present. The first is the University's commitment to the attributes of a University of Wollongong graduate expressed in a policy that filters down to all levels of the teaching and learning environment. The importance of this policy was made very clear in the University's audit by AUQA in 2005. The Careers Service is one of the primary units responsible for implementing such policies and their programs make the Graduate Attributes explicit for students. The Careers Service also recognise the potential that ePortfolios have in helping students prepare for the process of job seeking.

Another driving force comes from those disciplines such as Design and Engineering whose extensive use of paper-based design logs creates an existing "portfolio culture" as well as those such as Education and Medicine who are guided by requirements set by professional bodies for the collection of materials to demonstrate discipline-specific skills development. The combination of these influences has resulted in the decision to adopt a system which can be implemented across the whole institution but is flexible enough to meet the diverse needs of the different stakeholders.

Whilst the trend for ePortfolio adoption is on the increase, the methods for implementing such tools across entire institutions are many and varied. Central to successful implementation of ePortfolios, according to Roberts et al. (2005), is the consideration of the perspectives of the multiple stakeholders involved in the process, the collaboration of pedagogical, administrative and technical processes and integration of technologies into effective frameworks. Gathercoal et al. (2002) identified twelve critical factors for successful implementations of ePortfolios, and this list – which is discussed and reconfigured later in the paper - fits tightly with the trial outcomes and concerns of faculty and management at the University of Wollongong, and therefore with our research efforts.

Our research extends these themes and provides new information about the management of institution-wide educational technology implementations for teaching and learning.

Background to the project

Attributes and opportunities portfolio

In 2002 Martin Smith from the UoW Careers Service and Kate Bowles from the Faculty of Arts successfully applied for internal project funds to develop and trial an online ePortfolio, after early experiments with reflective stimulus questions delivered via the Online Learning Management System, WebCT. The primary author joined the team at this point and designed the first trial ePortfolio using a Filemaker Pro database with data entered via standard webpage forms.

The 2002/03 trial ePortfolio gave students the ability to reflect on their learning experiences across three domains (Work, University, and Community) and against eight common graduate employment criteria which mapped against the UoW Graduate Attributes (see Figure 1).

The CARL framework (Context, Action, Response, Learning) structured the major text entry fields for the student to describe their learning experience, with an additional 'summary' field provided to allow a quick overview of the record, essential for making sense of multiple records later. The CARL framework is an important scaffold for learning (Wood et al., 1976) and has been maintained in later trials as it has been shown in both trials to be effective in supporting the students in writing an effective and well-structured reflection of the learning event (see Figure 2).

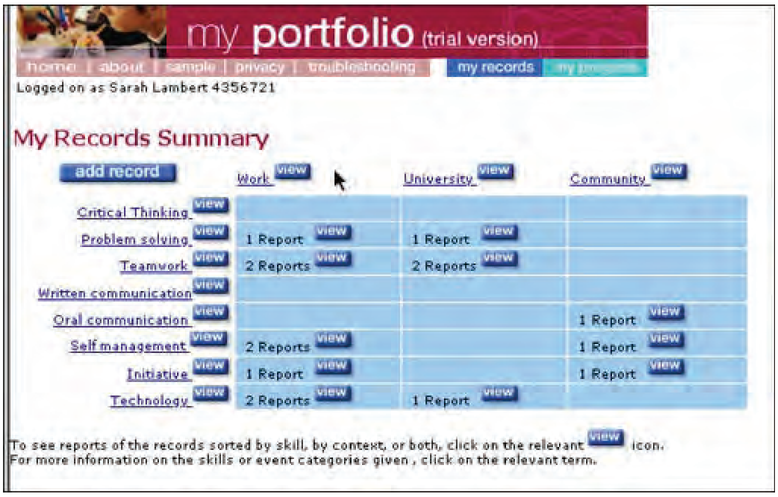

Figure 1: The attributes and outcomes portfolio (2003)

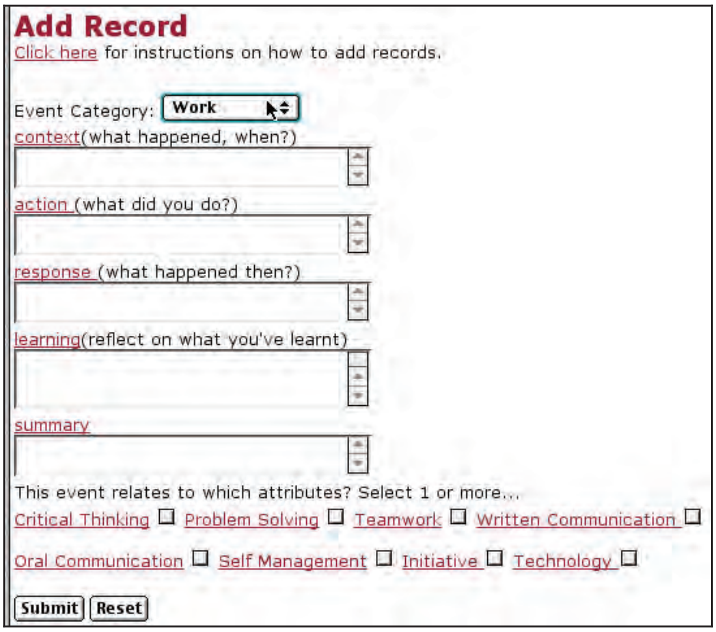

Figure 2: Input screen to the 2003 trial ePortfolio showing the CARL framework and use of pulldown menu and checkboxes to 'tag' each record

The trial over two different student cohorts in the Faculty of Arts was a success and identified many benefits to students, academics and the University. The trial also identified three pathways or take-up models for future institution-wide implementation:

1 *Academic Integration via the curriculum* (where subject coordinators choose to use the Portfolio tool either in assessment tasks, or to recommend the use of the tool in order to make visible the graduate attribute acquisition occurring in the curriculum).
2 *Prompted* (for example, by the Careers Service or Learning Development, or by academic advisors outside the context of specific subjects).

3 *Self-managed* (optional and available to all students, and embedding sufficient instruction and help files in the tool itself to enable interested students to use the portfolio without specific support or training).

Of these take-up models, the first two were favoured as the most transformative in terms of impact on students' engagement, but also required the largest ongoing effort to realise the potential that ePortfolios have to improve teaching and learning on campus. This first trial also identified gaps in many students' skills that would need to be addressed. More explicit teaching of both reflective practice (writing reflectively about learning) alongside training in the technical aspects of ePortfolios were required.

2006 wiki trial

In the autumn semester of 2006, approximately 300 students from Performance and Journalism disciplines trialled an ePortfolio using "wiki-on-a-stick" (memory stick) technology. The wiki allowed students to edit a webpage and the memory stick allowed them to store and transport their work to numerous locations.

As Augar et al. have noted, "Ward Cunningham used the word wiki (the Hawaiian word meaning quick) to name the collaborative tool he developed for use on the Internet in 1994. Wikis are fully editable websites. Users can visit, read, re-organise and update the structure and content (text and pictures) of a wiki as they see fit." (Augar et al., 2004, 95).

There are over 100 wiki products currently available on the Internet. The particular wiki chosen for the 2006 trial was based on the Tiddlywiki open-source product which is designed for individuals to maintain their own webpage. This version does not feature collaborative functionality. The Tiddlywiki was chosen for its ease of customisation and low-cost. The product was free and thus the only 'cost' in the 2006 trial was the primary author's time to customise for each trial student cohort – half a day to a day's work for each customisation. The wikis provided to students as the trial ePortfolio tool were highly customised to allow students to document and reflect on their progress towards achieving the University's Graduate Attributes as well as a handful of discipline-specific skills. The wiki could also provide active URLs and links to samples of students' work.

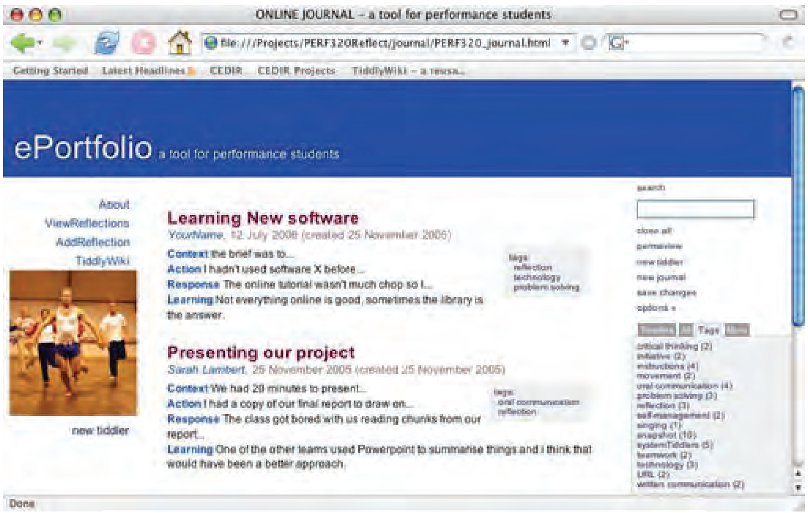

Figure 3: A screen shot of the ePortfolio for performance students

The aims of the 2006 trial which were successfully met were three-fold:

1 To keep dialogue and momentum going on campus about Graduate Attributes and ePortfolios
2 To provide students with an electronic resource for their journal assignments, responding to academic requests, and

3 To investigate the latest wiki and blog (web-log or journal) tools with potential for use as an ePortfolio.

Based on the results of the 2002/3 trial we were aware that staff and students have a range of computer skills and level of confidence, and so adequate time must be set aside for explicit teaching of the tool and the reasons for using it. As McKinnon has noted, "students continue to require significant introduction to the technology in order to overcome the associated anxiety" (MacKinnon, 1999, p.3).

Therefore, substantial orientation and 'getting started' sessions were provided, and the support package provided for students of the trial cohorts typically consisted of:

1 A 1½ hour orientation session in a computer lab in the class time, including a discussion regarding the requirements of potential employers for evidence against job selection criteria such as the Graduate Attributes.
2 A one page step-by-step handout identifying basic 'getting started' activities such as adding name and details, rating current Graduate Attribute skills level, and practicing one or two learning reflections using the CARL framework.
3 A one page overview of the navigation mechanisms and browser specifications of the wiki including screen shots.
4 In some cases a follow up session was booked in the computer labs in tutorial time in week six to provide support for those who were still unsure how to use the tool.
5 In addition, the computer lab staff and management were briefed on the browser requirements and provided with the help and support documentation to allow them to help students who may present with problems in the labs out of class time.

As with the 2002/3 trial, substantial time was also spent with the academics involved. The author met regularly with subject co-ordinators to design the assessment task for their students, and to customise the tool appropriately.

Survey evaluations (sample size n=68) showed that the ability to reflect on Graduate Attributes and Professional Skills and the opportunity to learn new technology skills were worthwhile student outcomes of using the ePortfolio. The orientation sessions provided were also rated highly by the students. As for the 2002/3 trial, reflective writing practice did not come naturally to most students and they required quite a bit of explicit teaching as well as practice at it before becoming comfortable. A small number of students steadfastly failed to see the point in spending the time reflecting on their learning, an attitude also present to a small degree in the earlier trial.

The wiki technology chosen was not popular with students due to their desire to work on the ePortfolio at home and work, while their computers at these non-university locations were not configured adequately. As Lamb (2004, 48) observed "there are no unified set of software characteristics that are shared by all wikis" and, as in the case of the trial wiki, many require very specific computer configurations. One key recommendation regarding the technology behind an ePortfolio tool was to move to a server solution, meaning that the scripting complexity that provides functionality should be handled on university computer servers and not handled at the users' desktop.

A smaller trial was also conducted as part of a Careers Service Program, where the ePortfolio provided was a structured Word document. The CARL framework was also embedded in the document and a small group workshop was conducted on its use. The students who opted to take up the ePortfolio had no significant problems with its use, and could readily see its potential for job searching.

Objectives of the current project

The implementation of a University-wide ePortfolio has now moved into a new phase with the approval of funding for a project team to manage the deployment of a university-wide ePortfolio system.

After a review of a number of wiki, blog and ePortfolio tools on the market (both commercial and open-source) the new Blackboard ePortfolio tool for Vista has been identified as the tool that meets all current ePortfolio requirements, is tightly integrated with the University's Learning Management System and also has a range of other features attractive to ePortfolio users. The use of this tool will overcome the limitations of users' browsers identified in the 2006 trial. Pending satisfactory trials in Session 2 of 2006 and appropriate funding, the Blackboard ePortfolio tool for Vista could be implemented by February 2007.

Whilst the features of the tool, student access and readiness to use it are important considerations, from trial experience we consider that they are, however, not the largest hurdle to meeting the wider project aims to implement a single University-wide ePortfolio that is integrated into academic programs. As other researchers have noted, "a critical success factor for electronic portfolio implementation is a culture where faculty understand their central role in the portfolio process as resource providers, mentors, conveyors of standards, and definers of quality" (Gathercoal et al., 2002, p.30).

Therefore, the role of the project team is to ensure a quality, educationally-sound implementation of the ePortfolio tool with a focus on faculty, school and discipline consultation to be able to customise the tool to allow students to reflect on, and store evidence of, their achievements and learning against the University's Graduate Attributes, Industry-based Professional Skills, or a combination of both Graduate Attributes and Professional Skills. Due to the focus on the Graduate Attributes, another important success factor for this two-year project is the development of a culture where faculty and students better understand what these attributes mean and how they can best record, reflect and store evidence of them.

With the technology aspects of the ePortfolio tool (such as setting up the Blackboard ePortfolio for Vista tool trial) to be handled by existing proven structures for managing eTeaching at the University of Wollongong, primarily eTeaching Services of CEDIR collaborating with Information Technology Services, this leaves the focus of the funded ePortfolio project squarely on the academic aspects.

Project team structure

Therefore, a project team structure has been developed with a Project Manager located in CEDIR (a central support unit) whose role involves liaison regarding the technology but is primarily responsible for overseeing two teams – one to guide the academic integration and the other, a reference group having representatives from each Faculty and Unit, to ensure their needs are met. In addition, a Graduate Attributes Project Officer was appointed to the Careers Service in 2006 on a range of projects including the ePortfolio project.

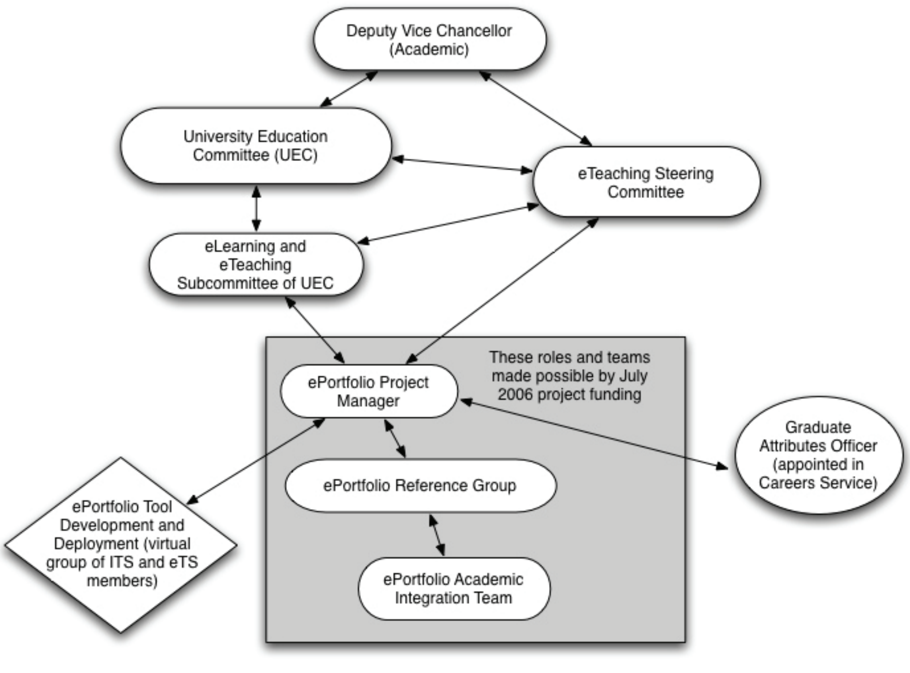

Figure 4: Student ePortfolio project structure

This new project structure responds to our own experience in the ePortfolio trials as well as the critical success factors for implementation developed by Gathercoal et al. in 2002. By clustering the original list of twelve success factors into two categories – Technology and Infrastructure, and Academic Integration – we have been able to map out the scope of each team working on the project.

Table 1: Factors rearranged into technology infrastructure and academic integration arenas

Technology and infrastructure arena	**Academic integration arena**
Information Services Cooperation	Portfolio Culture
Administrative Support	"Implementing Force" and Project Champions
Technology Infrastructure	Implementation Milestones
Training and Help Resources	Faculty Commitment
"Implementing Force" and Project Champions	Standards- or Competency-based Curriculum
Student Learning-Centred Culture	Feedback provided by supervisors and mentors using the Webfolio/ePortfolio
Standards- or Competency-based Curriculum	
Integrated curriculum developed by teams of faculty	

The first four success factors from the Technology and Infrastructure Arena column are already present in the structure and relationship of eTeaching Services and Information Technology Services. The "Implementing Force" and Project Champions roles are encompassed by the eTeaching Steering Committee as well as members of the e-Learning and Teaching sub committee of the University Education Committee, which includes representatives from every faculty and unit on campus. The latter three factors in this list are factors of the UoW teaching and learning environment, acknowledged by AUQA.

This leaves the Academic Integration Arena, whose success factors become the focus of the newly formed ePortfolio Academic Integration team, set up for this particular project implementation.

The primary role of the Academic Integration team will be to look at best practice models of integrating reflective practice, Graduate Attributes/Professional Skills awareness and ePortfolio usage into the curriculum of programs. The ePortfolio Academic Integration team will further investigate and write guides for the three ePortfolio take-up models already identified:

1 compulsory and assessed as part of a course
2 introduced as a support resource to a course, however not directly assessed, and
3 optional and not assessed.

While this team is newly formed and will develop over the course of the program, it is expected that it will collaboratively develop a range of teacher-centred support documents to assist faculties to integrate the ePortfolio into programs and courses in a pedagogically sound way, e.g. development of a "Tips for Reflective Practice" resource, learning designs for ePortfolios, a guide to running ePortfolio Induction and Orientation Sessions, and Good Practice Guidelines for Assessing ePortfolios.

In conversations with faculty as part of planning for the 2006 trial, it became obvious that in some areas a lack of 'portfolio culture' in paper-based forms could also be a hurdle to moving forward - a factor also noted by Gathercoal et al. (2002). In this instance it may be advantageous to first run paper-based portfolio assignments to allow staff and students to become familiar with reflective practice and Graduate Attributes prior to moving into an ePortfolio. As Gathercoal et al. (2002, p.30) noted, "Obtaining faculty participation is much easier when the academic unit already uses a paper portfolio process".

Therefore one strategy the project team are considering is to identify multiple subjects cross-campus with current portfolio or journal-type assignments and target these for moving to the ePortfolio tool within the same timeframe, supported by central staff development workshops. Another strategy will be to work with faculty education committees and/or course co-ordinators to map these subjects in programs of study. This will show whether enough subjects are participating actively, using an 'optional' take-up model, and whether this is appropriate and desirable for each program. If necessary it may be useful to identify further subjects to assess the ePortfolio and work with subject co-ordinators to first implement paper-based portfolios, prior to refining learning tasks and criteria, and moving to ePortfolios in subsequent teaching cycles.

Consultative framework

Preliminary rounds of consultations with faculty staff and management have indicated that the new Graduate School of Medicine and the Faculty of Education will be the first implementers of ePortfolios at the University of Wollongong, having external accrediting body requirements to have them ready for February 2007. The Faculty of Engineering, which has been moving forward strategically with Graduate Attributes and Professional Skills reviews, is a likely second wave adopter, which will help it demonstrate its commitment to integrating Professional Skills across the entire program of study to its own accrediting body, Engineers Australia. In addition, the Faculty of Law, Faculty of Science and the School of Nursing are also in preliminary discussions about adopting ePortfolios with clusters of staff members in the Faculty of Arts and Faculty of Creative Arts also keen to proceed. Each has a slightly different context and policy mandate and these discussions indicate the complexity of faculty culture and the many factors that require consideration when developing ‘implementation milestones’ – another success factor.

Therefore the way forward involves a range of conversations and many decisions have to be made. The kinds of questions to be asked include:

- What level of awareness have staff and students of Graduate Attributes in this Faculty/School?
- Are there mandated or optional Professional Skills criteria for this Faculty/School?
- What level of awareness have staff and students with journaling or reflective practice in this Faculty/School?
- Have staff and students experienced a paper-based or electronic portfolio in this Faculty/School?
- Are curriculum reviews on the near horizon as part of Faculty/School planning?
- What take-up models do Faculty/School staff and management favour?
- What timeline is appropriate for implementing portfolios or ePortfolios in the Faculty/School?

To guide the process of ePortfolio implementation, the authors have developed a new consultative framework to ensure the implementation parallels faculty consultation about academic integration issues (see Figure 5). The framework starts with discussions leading to key decisions regarding ePortfolio implementation, for example, what set of criteria are students using to reflect and store evidence against? Staff demonstrations and tool customisation follow, leading to a small-scale pilot. This can run in parallel with discussions leading to appropriate subjects being chosen and appropriate learning tasks being refined to scaffold the ePortfolio use.

The consultative framework process has already been used successfully in working with academics in the 2006 wiki trial. Since formally drawing up the schema, we have also found it useful as a dissemination device, in discussions with Faculty management and teaching staff. This helps reassure them of their central role as decision makers in a localised Faculty-based implementation suitable to their needs, in which they are making key decisions and in which we have the skills and experience to guide and facilitate this process. It is expected that this will lead to increased faculty commitment to quality ePortfolio take-up, which will be integral to the project’s success.

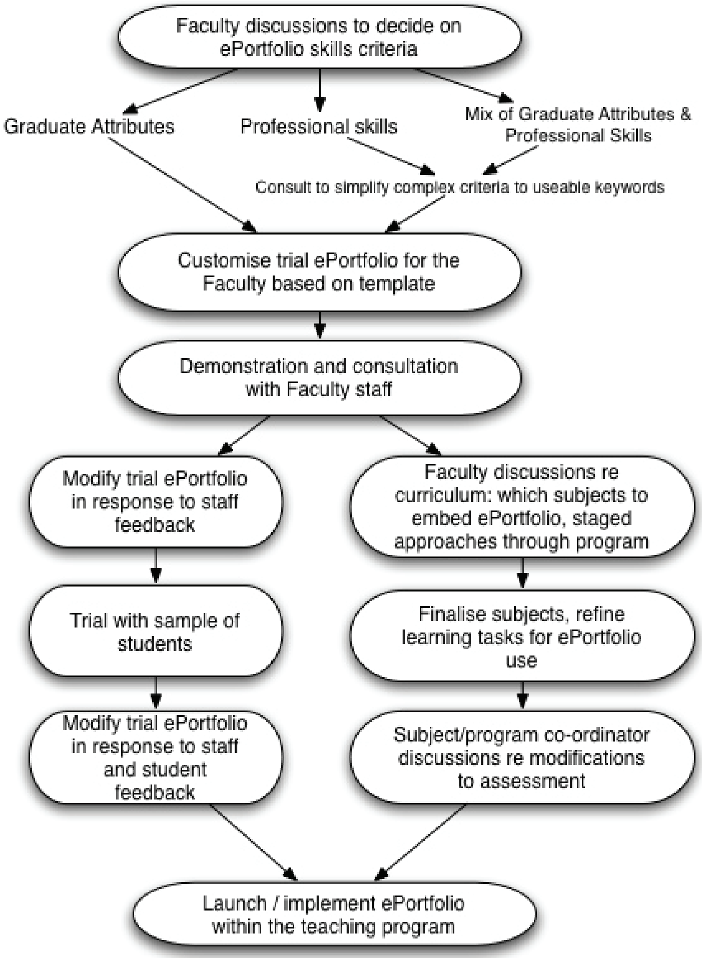

Figure 5: Consultative framework for developing Faculty-based Student ePortfolios

Conclusions and future directions

There is still much work ahead to roll out the ePortfolio tool across campus over the two-year timeframe. The knowledge will build, and the approaches will be refined, including the consultative framework. As we integrate the ePortfolio into new programs and subjects there will be further opportunity to evaluate the tool in different discipline contexts. In addition, further research into the kinds of learning designs, assessments and approaches which are useful as students progress from first year to third or fourth year of their undergraduate studies is an emerging area of interest.

References

Augar, N., Raitman, R. & Zhou, W. (2004) Teaching and learning online with wikis. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Philips (Eds), *Beyond the comfort zone: Proceedings of the 21st ascilite Conference* (pp. 95–104). Perth, 5–8 December. http://www.ascilite.org.au/conferences/perth04/procs/augar.html

Avraamidou, L & Zembal-Saul, C. (2006). Exploring the Influence of Web-Based Portfolio Development on Learning to Teach Elementary Science. *AACE Journal,* 14 (2), 178–205.

Barrett, H. (2001) *Electronic Portfolios*, http://electronicportfolios.com/portfolios/encycentry.pdf [viewed 28 July 2006].

Barrett, H. (2003). *The Research on Portfolios in Education*. http://www.electronicportfolios.com/ALI/research.html [viewed 28 July 2006].

DiBiase, D. (2002). *Using e-Portfolios at Penn State to Enhance Student Learning*. https://www.e-education.psu.edu/portfolios/e-port_report.doc [viewed 28 July 2006]
Gathercoal, P., Love, D., Bryde, B. & McKean, G. (2002). On Implementing Web-Based Electronic Portfolios. *Educause Quarterly,* 2, 29–37.
Jafari, A. (2004). The “Sticky” ePortfolio System: Tackling Challenges and Identifying Attributes. *Educause Review*, July/August 2004, 38–48.
Lamb, B. (2004). Wide Open Spaces: Wikis Ready or Not, *Educause Review,* September/October 2004, 36–48.
Luca, J., Polinelli, D. & Howell, J. (2003) *Creating E-Portfolios to Support Student Career Opportunities*. http://auc.uow.edu.au/conf/conf03/papers/AUC_DV2003_Luca2.pdf [viewed 27 July 2006].
MacKinnon, G. (1999). *Electronic Portfolios in Pre-service Science Education*, Technical Report, Acadia University, Eric No. ED437029.
Ravet, S. (2005). EPortfolio for a Learning Society. *eLearning Conference*, http://www.elearningconference.org/Speakers_papers/Serge%20Ravet%20-%20Paper.doc [viewed 28 July 2006].
Reardon, R.C., Lumsden, J.A. & Meyer, K.E. (2005). Developing an E-Portfolio Program: Providing a Comprehensive Tool for Student Development, Reflection, and Integration, *NASPA Journal*, 42(3), 368–380, http://publications.naspa.org/naspajournal/vol42/iss3/art6 [viewed 7 April 2006].
Roberts, G., Aalderink, W., Cook, J., Feijen, M., Harvey, J., Lee, S. & Wade, V.P. (2005) Reflective learning, future thinking: digital repositories, e-portfolios, informal learning and ubiquitous computing. *ALT/SURF/ILTA Spring Conference Research Seminar,* http://www.alt.ac.uk/ALT_SURF_ILTA_white_paper_2005.pdf [viewed 10 July 2006].
Wood, D., Bruner, J.S. & Ross, G. (1976). Role of Tutoring in Problem-Solving, *Journal of Child Psychology and Psychiatry and Allied Disciplines,* 17(2), pp. 89–100.
Song, K., Scordias, M., Huang, C., & Hoagland, C. (2004). *Implementing e-portfolios in a university: An enterprise solution*. Paper presented at the Society for Information Technology and Teacher Education (SITE) Conference, Atlanta, *Georgia*, http://www.aace.org/dl/files/SITE2004/paper_3014_7985.pdf [viewed 26 July 2006].

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Modelling blended learning environments: Designing an academic development blog

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A major challenge facing academic developers is meeting the development needs of both time poor academics and those staff in multi-location campuses, especially sessional tutors, who may start teaching several weeks before electronic access is enabled. Necessary restrictions placed on access to local intranet and Learning Management Systems meant rethinking how to meet the needs of all staff and in the process model good practice through the use of blended learning environments. One regional university, with seven national and one international campus, is currently redesigning their staff development program to incorporate the use of blogs and wikis to provide access for all staff to a collaborative space to support improved teaching. This paper provides a rationale for the new direction and outlines the design phase to incorporate the use of collaborative technologies within the staff development program. It outlines the challenges faced in designing the environment and provides an overview of the design for the pilot phase.

Keywords: staff development, blogs, wikis, blended learning environment, sessional tutors

Introduction

Whilst the role of professional development has traditionally been to introduce and facilitate improved teaching practice through face to face workshops, a move to blended environments supported by various technologies provides better access and opportunities for all staff regardless of location or teaching commitments. It also provides opportunities for academics to share their understandings and knowledge whilst developing new conceptions of learning through engagement in a blended learning environment.

Rationale

Current models of professional development for teaching and learning fail to meet the needs of the diverse and mobile workforce in universities. Academic Developers need to model the kinds of design that is required by academics when teaching in multi-location campuses and particularly the move to blended learning environments (Lefoe & Hedberg, 2006). In addition, there is a move away from workshops that focus on information sharing to those that engage in active learning strategies. This encourages participants to become involved in a scholarly approach to their teaching, and to develop support colleagues and networks for “corridor conversations” in the virtual world. The staff development team in a regional university determined that extended programs that combined face to face activities and engaged participants between sessions in social collaboration provided a better opportunity to develop networks and to create the kind of cross disciplinary dialogues we wished to encourage. Following the design phase for this strategy we determined a need for technology to support the initiative and investigated the use of blogs and wikis to support the knowledge sharing and collaboration phase. The paper examines the possibility of using these technologies to support the initiative and follows the process used to identify a suitable tool. The current Learning Management System was deemed unsuitable for the activity because of the determination for the process to be ongoing and the need to situate the program outside of the usual semester times in order to meet the needs of sessional tutors and other academic staff.

Literature review

Whilst many descriptive studies of the use of such technologies for staff development exist, little research has been conducted in the area. Some research has been conducted into the use of such tools within teaching in higher education (see for example, Martindale, 2005; Oravec, 2003; Williams & Jacobs, 2004) and others have looked at the benefits for the professional development of school teachers (Havelock, 2004; Schuck, 2002). There is a general agreement that there is potential for educators at all levels to support the development of scholarly communities with the careful design of such environments (Segrave, Holt and Farmer, 2005). Segrave and associates suggest a model for Academic Professional Capacities Development and though they describe more broadly how to enhance effective online learning and teaching, they highlight methods and processes which are applicable to our study.

The design of learning environments utilising blogs or wikis is an emerging area for research. Blogs appear to be used as a collaborative or reflective space to support students' reflection on resources and content (Dron, 2003; Williams & Jacobs, 2004). Farmer & Bartlett-Bragg (2005) maintain that the incorporation of blogs allows for the integration of content, communication and participation, breaking down the traditional segregation of these components, which is imposed by a traditional Learning Management System. In order for the effective adoption and utilisation of blog within a course the design and integration of the blog needs to be carefully considered. Bartlett-Bragg (2003) propose an adaptation of Salmon's (2000) model of supporting computer mediated communication in order to facilitate the effective use of blogs within learning. She proposes a five stage integration of a blog into a learning environment: 1. Establishment, 2. Introspection, 3. Reflective monologues, 4. Reflective dialogue, 5. Knowledge artefact. Blogs allow not only the development and sharing ideas within a collaborative environment but also remote access to the information through the use of an aggregator to receive RSS (Really Simple Syndication) feeds to their desktops, facilitators can post comments remotely and receive email alerts to new postings.

Research questions

There are three key questions driving our investigation in this area and this paper addresses the design phase of the initial research for question three. 1. How can we effectively support academics to transition to new ways of teaching using blended learning environments? 2. How can we model new teaching practices within the staff development program? 3. Can technologies support this transition and if so what are the most appropriate technologies to use? We will conduct an evaluation of the implementation of a pilot phase of the model in 2006 before wider implementation in 2007.

Design phase

The development of the blog was a collaboration between learning designers and academic developers at the university. An initial meeting determined the requirements of the Staff Development Blog:

- To develop a blended model of staff development which offered collaboration, knowledge building and the sharing of resources beyond the face-to-face workshop;
- To model innovative flexible teaching tools which can support collaboration and resources sharing;
- To identify and adopt an easy to use tool;
- To meet the needs of two user groups, staff developers and workshop participants;
- Open access area for sessional staff and others to access without restriction;
- Closed access area for Academic Developers to allow resource sharing and collaborative development of workshops; and
- Externally hosted to allow for pilot and evaluation during refinement and internal hosting in the future.

These parameters guided the investigation and evaluation of a number of blogs and wikis. Edublog was chosen for the task since it met all of the criteria and offered a number of additional useful features such as a wiki (see Farmer, 2005). The results of the evaluation are indicated in Table 1.

Challenges for learning designers

The use of an educational blog presents a number for challenges for learning designers. Whilst the development of the blog was relatively easy, the initial evaluation of the blogs and wikis was time consuming. As emerging technologies, new versions with additional features are constantly emerging. Before designing a blog there is a need to revisit the evaluation of the preferred tools, to identify the new features. Designers need to clearly articulate the educational design needs and evaluate the products according to these criteria.

Table 1: Blog and wiki evaluation

	Elgg	Blogger	Tiddly Wiki	Media Wiki	EduBlog
Easy to use	√	√	√	√	√
Ability to assign categories/tags	√	x	√	√	√
Ability to link docs, graphics, urls etc	√	√	√	√	√
External hosting	√	√	√	√	√
Ability to set access levels	x	√	x	x	√
Customisable themes	√	√	√	√	√
RSS	√	√	√	√	√

When designing the learning experience there is a need to be aware of barriers to effective participation. Previous evaluation of blogs in education has identified a number of barriers. The nature of a blog as a public publishing space can be intimidating for some participants there is a personal expectation of high quality comments which many find intimidating. Reading and contributing to the blog is seen as time consuming. In order to maximise the potential of the blog for professional development both the blog site and the learning design need to be designed and structured effectively. Three areas, learning tasks, supports and resources were considered in the design of the CEDIR academic development blog (Table 2). The design draws on existing support and resources and models effective incorporation of a blog within an educational environment.

Table 2: Learning design

Learning tasks	Learning support	Learning resources
Learning tasks are directed by the relevant academic development activities.	• Blog • Workshop presenters modelling use of tools • Online support and mentoring • Online collaboration between presenters and participants	• Online blog to enable participants to view own, peers and presenters comments • Workshop resources (PPT, doc, images, sound and video) • Links to web based resources • RSS aggregated to individual's computer. • EReadings

Design with Edublog

The support resources and documents provided by Edublog enabled the blog to be designed and established quickly. By utilising the planning questions provided by Edublog, the blog wish list was able to be refined and guide the development of the specific tool. Features, which were particularly useful for the blog, were the categories, pages, links, comments area, search and RSS feeds. The drag and drop linking of resources, email alert for administrators, the ability to contribute remotely and the link to Wikispace were particularly useful. Pages, categories, sub-categories, and links were identified. A site was established and created, a template theme was applied, and the site propagated with initial content. A group of staff participated in an initial evaluation, which led to refinement of a number of features.

Conclusion

As the design phase nears completion, implementation of Edublog for a pilot staff development activity will occur in the second half of 2006. The capacity of the tool to support information and knowledge sharing, as well as opportunities for cross faculty communication and collaboration will be explored in the evaluation of the tool. The next challenge is to examine how we will engage staff in using the tool.

References

Bartlett-Bragg, A. (2003). Blogging to learn. *The Knowledge Tree*. http://www.flexiblelearning.net.au/knowledgetree/edition04/html/blogging_to_learn_intro.html [viewed 15 June 2006].

Dron, J. (2003). The blog and the Borg: a Collective Approach to E-Learning. In G. Richards (Ed.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2003* (pp. 440-443). Chesapeake, VA: AACE.

Farmer, J. & Bartlett-Bragg, A. (2005). Blogs @ anywhere: high fidelity online communication. In H. Goss, *Balance, fidelity, mobility: Maintaining the momentum? Proceedings of the 22nd Annual Conference of ascilite* (pp 197- 204). Brisbane: Teaching and Learning Support Services, QUT.

Havelock, B. (2004). Online community and professional learning in education: Research-based keys to sustainability. *AACE Journal*, 12(1), 56-84.

Lefoe, G., & Hedberg, J. (2006). Blending on and off campus: A tale of two cities. In C. Bonk & C. Graham (Eds.), *Handbook of Blended Learning Environments: Global Perspectives, Local Designs* (pp. 325-337). San Francisco: Pfeiffer.

Martindale, T., & Wiley, D. A. (2005). Using Weblogs in Scholarship and Teaching. *TechTrends Linking Research and Practice to Improve Learning*, 49(2), 55-61.

Oravec, J. A. (2003). Blending by blogging: weblogs in blended learning initiatives. *Journal of Educational Media*, 28(2-3), 225-233.

Salmon, G. (2000). *E-Moderating: The Key to Teaching and Learning Online*, Kogan Page, London.

Schuck, S. (2002). Professional development of teacher educators: The eChange Project example. In C. Crawford et al. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 2002* (pp. 716-720). Chesapeake, VA: AACE.

Segrave, S., Holt, D., & Farmer, J. (2005). The power of the 6three model for enhancing academic teachers' capacities for effective online teaching and learning: Benefits, initiatives and future directions. *Australasian Journal of Educational Technology*, 21(1), 118-135.

Williams, J. B., & Jacobs, J. (2004). Exploring the use of blogs as learning spaces in the higher education sector. *Australasian Journal of Educational Technology*, 20(2), 232-247. http://www.ascilite.org.au/ajet/ajet20/williams.html [viewed 31 Jul 2006].

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Who's designing what for whom? Comparing taxonomies in web-based educational design galleries

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Web-based galleries of educational design examples are a display space for educational innovation and a construction space for the educational identities involved in the growing educational innovation business. Taxonomies of seven web-based educational collections are compared and analysed in terms of how identities are constructed for the educational design model range, the teacher audience and educational design practice. The design collections struggle to form a coherent structural frame around their field of common interest not because they lack structures to build upon but through failure to deal with existing structures, starting with the common interest itself, shared by all without being clearly articulated by any. Other structural blind spots are apparent in the lack of representation for learning in workplace and community settings and in a failure to clearly distinguish the perspective of design user from that of design producer. A sharper focus on the user context in educational design classification would be helpful not only in improving the structure and usability of future educational design collections but also in facilitating communication generally between users and producers of educational design.

Keywords: educational design, instructional design, learning design, repositories, re-usability, dissemination of innovation, e-learning

Introduction: Educational design galleries as an emerging web genre

Well-organised collections of previous work are an essential enabler for designers of learning resources, as for practitioners in any craft. To progress in the field, and to have any sense of direction in the field, designers need to be able to review and draw upon models of previous work. Few learning resource repositories or portals, however, are able to accommodate the specific needs of educational design modelling. Portals such as Ariadne, MERLOT, MIT OpenCourseWare and AEShareware are organised around materials for direct use in subject teaching rather than as design models. Their navigation is based on subject matter rather than design approach. Browsing for educational design approach is not supported. There has been considerable interest in creating educational design collections that address this gap, by making resources available in an explicit educational design framework (Carrick Institute, 2006; Buzza, Bean, Harrigan & Carey, 2005; McNaught, Burd, Whithear, Prescott & Browning, 2003). However, reporting of cases focuses on individual projects (Holt, Borland, Farmer, Rice & Mulready, 2005; Brack, Samarawickrema & Benson, 2005; AUTC, 2003b; Oliver, Harper, Hedberg, Wills, & Agostinho, 2002) rather than online design collections as a genre. Indeed, there is not even a generic name for this type of learning resource collection. In this paper, such collections will be referred to as educational design web galleries, or 'ED galleries' for short.

The paper compares the approaches of seven different galleries in creating a structured framework for their examples of educational design work, focusing on the classification systems or 'taxonomies' that provide the structural framework in each case. To what extent have existing galleries managed to address the key problem of how to structure the complex field of educational design in a way that supports effective online navigation? What indications do they give of how the problem might be better addressed in future? What guide do they provide for new gallery developers?

The paper is written as part of ongoing work on development of classification frameworks for the dissemination of educational design material, but is limited to review of frameworks found in existing ED galleries. It does not propose any new framework. It does not deal with other aspects of the ED galleries such as specific examples contained there. The focus is on the classification systems under which those examples are organised. Review of the vast literature concerning the classification of educational ideas generally is also beyond the scope of a paper of this length. The paper is concerned only with classification frameworks that are implemented in the form of web-based galleries of educational design.

Identifying educational design galleries

Educational design galleries are identified by: (1) a variety of educational design examples in practical learning context (2) construction in website form (3) organisation in categories related to educational approach. Educational design is understood as the business of saying how learning is to be supported in particular practical cases (Goodyear, 2005). An educational resource qualifies as an educational design example to the extent that it presents a particular way of addressing a particular kind of learning need in a practical context. An educational design gallery groups these examples in a way that enables their different strategies of learning support to be viewed collectively, as a range of possible design options for a specific context. An educational design gallery is, in simple terms, a collection of practical learning resources that are indexed by their educational approach. The ability to navigate the collection in terms of educational approach is the key distinguishing feature that separates galleries of educational design from other online repositories of learning resources. The classification system used in the educational design gallery is central to the analysis of the gallery because the classification system is what enables the gallery to function as such in the first place.

Selecting galleries for comparison

Galleries for study were selected according to the three criteria listed above and two extra requirements: that the gallery material be at university level and that the gallery be publicly accessible from the World Wide Web. These limitations arise from the practical conditions of the study itself, undertaken from a university standpoint and dependent on the viewing access that the web provides.

Galleries were located by scanning links pages in the teaching and learning support sections of university websites and recent archives of relevant journals (*Australian Journal of Educational Technology*, in particular). The search focused initially on Australian sources but was extended to Europe and North America when the small size of the local pool became apparent. The search was conducted intermittently in personal time between July 2005 and March 2006. The process was slow and laborious with a large number of sites to be checked and frequent need to examine actual web site contents (not just titles) in order to decide whether criteria were met. A further hindrance was the low level of interlinking between sites. Google searches with keywords "educational' 'design' 'examples' and related terms were of little assistance, serving mainly to confirm the low profile of web-based ED galleries so far. Most existing educational resource sites were excluded from consideration by lack of one or other of the main gallery requirements: either the practical learning context or the indexing of resources by educational approach. Focus on university-oriented galleries and those that were accessible from the web reduced the range even further.

Seven galleries were found that met initial requirements. Five were local initiatives of individual universities and two were government projects. Three were Australian based, three North American and one based in Europe. Six out of seven sites were fully accessible from the World Wide Web. One was situated behind an authentication barrier requiring login and password but was rendered accessible for the purposes of study through presentation at an academic conference where guest login was provided and through subsequent reporting in conference proceedings (Brack, Samarawickrema, & Benson, 2005). The most difficult choice among the seven was DialogPlus Toolkit (fourth on list below). The site focused on development of new designs rather than display and provided selection menus for design features to be added to new designs, but no menus to enable browsing of features in the designs already created. However, the highly developed classification system on the design side of the DPT site made it hard to resist as a taxonomy example. The seven galleries are listed and briefly described in Table 1. For purposes of further discussion, the seven sites will be identified by initial letters as shown in the table.

Table 1: List of web-based educational design galleries with university orientation

Gallery	Description and URL
1. Contemporary Online Teaching Cases (COTC)	Contains interview-based case studies illustrating different approaches to teaching with new technologies at Deakin University, Australia. URL: http://www.deakin.edu.au/itl/teach-learn/cases/
2. DELTA - Designing Electronic Learning and Teaching Approaches (DELTA)	Showcase for work of local university staff in teaching with new technologies. Password protected site but temporarily open to public via guest login in July 2005. Based at Monash University, Australia. URL: http://muso.monash.edu.au/webct/cobaltMainFrame.dowebct
3. DesignShop (DS)	Guide to strategies of instructional design and teaching with new technologies. Contains mix of case studies and learning materials. Based at Virginia Tech, USA. Uses external and local sources. URL: http://www.edtech.vt.edu/edtech/id/index.html
4. DialogPlus Toolkit (DPT)	Online toolkit enabling users to produce design specifications for learning activities, described as 'Nuggets'. 'Nugget' examples created by previous users are available for viewing. Sponsored by UK & US governments. Site hosted at University of Southampton, UK. URL: http://www.nettle.soton.ac.uk/toolkit/Default.aspx
5. Learning Designs (LD)	Collection of learning design resources drawn from university staff across Australia and presented in a generic format designed to facilitate re-use. Product of an Australian Universities Teaching Committee project. Site hosted at University of Wollongong, Australia. URL: http://learningdesigns.uow.edu.au/
6. Teach with Technology (TwT)	Descriptions of learning activities and materials created by local staff drawing on new technologies, Collected in the 'Exemplary Projects' section of the site. Based at University of Minnesota, USA. URL: http://dmc.umn.edu/teach.shtml
7. UMUC-Verizon Virtual resource site for teaching with technology (UMUC)	Guide to use of web in teaching with examples illustrating a variety of strategies. Based at University of Maryland University College, USA. URL: http://www.umuc.edu/virtualteaching/

Method of comparison

The classification structures of the seven ED galleries are compared in a framework based on their web construction role. The classification systems are compared from the perspective of the three main website components: content pages, menus linking the pages together and the homepage that provides their main point of access. Each element is a crucial test of the classification function.

1 Content page level. What is the substance of the classification system used by the site? How is the content conceptualised? What is actually delivered? What sense is made of the notion of 'educational design example'?
2 Menu level. What is the structure of the classification system? How does it partition the content field of educational design? What sort of composition does it make? What range does it offer? What sort of coherence? What perspective?
3 Homepage level. Who is the target of the classification system? How does the classification system frame its intended users and their use of the site?

A website is a layered series of representational processes: from content field through site structure to screen interface (Collard, 2005). Starting with content pages and then site menus before reaching the homepage facilitates an analytical perspective that is informed by where the site comes from in terms of content and structure.

View from the bottom – what's in the galleries?

Each gallery example contains some sort of descriptive outline of educational design ideas and context accompanied in some cases, though often not, by access to the actual design product as used by learners.

The design objects displayed in this manner comprise courses, assessment tasks and formative learning tasks, plus tools and information resources used in all of these. Most sites have around 40-60 such ‘examples’. The main areas of contrast at the content level are the kind of detail in the examples given and the naming of the examples as a group.

Detailing of examples
Documentation of the design examples varies from a few lines in length (UMUC and DS) to several pages (LD). Outlines may comprise a tightly structured set of rubrics (LD) or a free-form statement without headings or fixed structure (COTC). The DPT site enables specification of 15 different design features but contains a large number of unfinished test designs left behind by visitors trying out the DPT design tools. The strongest in detailed explanation are the Australian sites, LD and COTC. American sites are better at providing open access to resources as used by learners, enabling the viewer to see how design ideas work in practice. However, the different national approaches to sharing of educational ideas must be left for later investigation. The main point here is simply that ideas on the details needed to make an educational design example are in a state of flux.

Naming of the examples as a group
‘Example’ is not the word used by the galleries themselves. Each gallery had its own term: ‘Teaching Cases’ ‘Learning Activities’, ‘Teaching/Learning Activities’, ‘Teaching Models’, ‘Instructional strategies’, ‘Nuggets’, ‘Exemplars’, ‘Guides’, ‘Exemplary Projects’. There was a general idea of an object showing how to teach accompanied by considerable uncertainty about the right words for saying what ‘how to teach’ and ‘showing how’ are. It is a paradoxical position for the galleries to be in: on the one hand providing models and standards for a particular subject and at the same time having no clear standard for naming the subject to be modelled – or the process by which modelling occurs. The paradox stretches even further when the subject is teaching, whose business it is to communicate models and standards - and the audience teaching practitioners! The galleries are guides to a terrain whose geography melts underneath them as soon as their different sketch maps are compared. Further evidence of struggle with shifting terrain is found on the next level, the gallery menus.

View from the menus: How are the content items sorted?

At the level of the sub-categories, two types of overall structuring can be observed: one overt and easily observable at the level of individual sites, the other implicit to some degree in every ED gallery but only observable when viewed as a group. The structures of the individual sites, summarised in Table 2, are the easiest place to start.

Table 2: Internal structuring among educational design sub-categories for each ED gallery

Gallery	ED sub-categories grouped as	Internal structuring
COTC	One menu –‘Approaches to learning’	No particular sequence within this menu
DELTA	One menu – ‘Learning activities by strategy’	Based on skill focus - uses Bloom's taxonomy but very selectively.
DS	Two menus – ‘Popular Teaching Models’ & ‘Web-Based Instructional Strategies’	‘Popular teaching models’ are organised on a continuum from ‘top-down’ to ‘bottom-up’. ‘Strategies’ list has no internal structure.
DPT	Multiple branching menus - too many to list here	Two basic divisions – ‘Nugget’ (aka ‘Activity’) and ‘Task’. Basically a division between options at level of general strategy vs options at level practical action, teaching tactics. As for DS (above).
LD	Three menus – ‘Exemplars’, ‘Guides’, ‘Tools’	Exemplars are grouped in four types of ‘learning focus’ derived from taxonomy in Oliver et al. (2002), plus one unrelated category.
TwT	One menu – ‘Exemplary projects’	No particular sequence within this menu
UMUC	One menu – ‘Teaching / learning activities’	No particular sequence within this menu

The galleries form two groups in terms of menu structure. One group has some sort of internal order within its educational design sub-categories. In the other group, educational design sub-categories form a more or less random sequence, shopping list style. They are held together by force of shared menu title and general affinity with the concept of educational design but not much else. Where internal ordering occurs, there is no single dominant approach. Nor is the ordering complete in any instance. The contrast is not between order and disorder, but between partial ordering among sub-categories and none at all.

The collective structure of the educational design sub-categories emerges from their patterns of recurrence across the selection menus of the various galleries. The pattern can be mapped by noting wherever a particular sub-category or related term is used on more than one site, and the frequency of recurrence. The recurrent items together form a series of thematic clusters, each cluster comprising the group of related terms through which a particular theme is expressed. The frequency of recurrence of certain themes provides an overall picture of the common design focus of the seven collections as a whole.

Table 3: Top educational design themes – according to number of galleries where each appears

Educational design theme	Number of galleries
Problem-based learning	● ● ● ● ● ●
Case-based learning	● ● ● ● ●
Simulation-based learning	● ● ● ● ●
Collaborative learning	● ● ● ● ●
Project-based learning	● ● ● ●
Research-based learning	● ● ● ●
Experiential learning	● ● ● ●
Concept development	● ● ● ●
Self-directed learning	● ● ● ●
Lecture-based learning	● ● ● ●
Role play-based learning	● ● ●
Field-based learning	● ●

The distribution enables identification of the top design types as a broad group but is not a reliable guide to differences within the group. The relative position of the various elements within the core group is not clear. The problem is not just similar levels of recurrence across the core themes, but that many of the themes are closely related. There is no agreement about where the dividing lines run. Case-based and problem-based learning can be treated as a single category in one gallery while another puts case and project together. To avoid being entangled in definitional arguments, the themes above have been compiled on a conservative basis, treating terms as part of the same theme only where the semantic connection is clear and obvious, such as 'collaborative' and 'cooperative learning'. With a different approach, the concentration of the field could be rendered even more dramatic than currently appears. What does not alter is the existence of the concentration itself. This is not an accidental distribution. Underneath appearances of diversity and originality at individual level, there is a strong sense of convergence among the galleries as a whole.

Determining the precise direction of the convergence between gallery classification systems is a tricky business. One approach is to trust the galleries and to see the concentration of interest around certain types as a natural product of their common wisdom and experience in real design practice. The importance given to the core group of design types would reflect nothing more than their actual importance in the real educational world. However, there are too many distorting tendencies at work for gallery classification systems to be considered in 'reflection of reality' terms. Three distorting tendencies are readily identified from the evidence of the distribution pattern: (1) arbitrary exclusion (2) arbitrary differentiation and (3) arbitrary grouping.

Arbitrary exclusion
A clear instance where gallery classification systems fail in their reflection of real world educational needs is their failure to include workplace learning as a design theme of comparable significance to those prominently mentioned. Workplace learning appears in a single gallery, DPT, where it is just one among

over 200 menu items. The omission of workplace learning is problematic not simply because the omission is inconsistent with the important role of workplace learning in university professional studies but because it is equally inconsistent with the espoused educational values of the design types most frequently featured in the seven ED galleries. The educational design types at the centre of attention across the seven galleries are in most cases types based in the concept of learning through authentic experience: problem based learning, project based learning, experiential learning, simulation role play etc. The omission of workplace based learning might possibly be rationalised by arguing that workplace learning is subsumed in these other authentic learning types, but this is a weak excuse when workplace based learning is the most authentically situated of any. When the distinction between workplace based learning and various ways of bringing ‘authentic experience’ into academic learning is treated as less significant than the fine-grained distinctions separating the latter, the concept of authenticity itself falls into question.

Arbitrary differentiation

Case based learning, project based learning, simulation and role play based learning merge and separate from one gallery and even within the same gallery. On the DS site, case based and problem based learning are identified as a single type of 'instructional strategy' on one menu and as alternative 'teaching models' on another. It might be concluded that gallery builders need to be more careful with their language and provide better explanations of what they use. However, this would be to miss the point. The key point is that the galleries have failed as a group to reach agreement on how to divide up their preferred range of educational design models. The problem is not that one or other gallery is loose in its language but that the terms themselves are inherently slippery (Wozniak, Mahony, Everingham, Poulos & Reid, 2005). The substantial effort invested by various galleries in explaining and justifying their category divisions count for little when there is no certainty for any gallery on which divisions are actually the important ones to make.

Arbitrary grouping

The basic structural rule of the ED gallery taxonomies seems to be one of perpetual reinvention. Nothing is repeated. No two taxonomies are alike. Where taxonomical structures are borrowed from other sources, the process is accompanied by substantial unexplained modifications. The LD site takes four categories from Oliver et al.'s (2002) ‘Description of Learning Designs’ and adds a completely unrelated fifth item. DELTA's taxonomy of ‘Learning Activities by Strategy’ reworks Bloom's taxonomy (Bloom, Kratwohl, & Masia, 1964) in a minimalist format comprising two cognitive levels, the whole affective domain and a non-specific category covering skills in general. Even DPT, the most systematic of the group, has its eccentricities. DPT borrows its taxonomy of ‘approaches to teaching’ from the taxonomy of theoretical perspectives of Mayes & De Freitas (2004) but with some unannounced reshuffling of contents in the process, and also some hardening of boundaries that were not originally intended to be categorical divisions between learning and teaching approaches (Mayes & De Freitas, 2004: 10).

Behind the arbitrary structures of the educational gallery menus, one positive overall pattern can be found. The primary clue to this pattern is the way that downgrading of workplace based learning combines with simultaneous promotion of other forms of learning through experience that work at a lower level of authenticity. Ip & Naidu (2001) make a distinction between 'edited' forms of experience-based learning where the experience is constructed for the learner and more 'authentic' forms where the learner’s own lived experience is the focus of the learning activity. The overall tendency of the gallery menus as a whole is one which puts learning by practical experience in edited forms ahead of more direct experience based learning. The situation has echoes of Baudrillard's ‘hypereality’ (1981), where simulations become the only form of reality recognised. The emphasis on more ‘packaged’ forms of learning by experience could equally be interpreted in terms of an economic climate favouring commodified forms of education generally. A more prosaic interpretation would be that the attention given to learning by experience in a variety of packaged models fits conveniently with the interests and perspective of the professional package builders. The educational design classification systems would be understood as having succumbed to a kind of ‘producer capture’, where the customer choice is decided by what producers are offering rather than customer choice determining the product range. Whatever the underlying motives, the outcome in the ED galleries is poor representation of user perspective in menu classifications. While the web conventionally functions as a medium driven by user choice (Krug, 2000), the situation appears otherwise in the ED gallery menus systems. Users are confronted with imposed choices of arbitrary construction and no clear relationship with practical learning or teaching needs. This raises the question of what exactly the user is supposed to be doing in the ED galleries, if not making user driven choices as web users normally would. The question must be answered in the framework of the overall purpose and strategy of the ED galleries as seen from the homepage.

View from the top: How do the galleries identify themselves?

The first problem raised by gallery homepages is one already encountered at content page level: the naming of the subject at hand. There is no consistent rendering of the two key conceptual elements: ‘educational design’ or its ‘examples’. Only one site (LD) has a title that identifies it as some sort of educational design collection. Only two sites actually have a specific name for the educational design business. In neither case is it ‘educational design’. Instead, ‘instructional design’ (DS) and ‘learning design’ (LD) are used. More often the idea of educational design is introduced by nothing more than indirect allusion, such as: ‘the selection of appropriate media to accomplish specific learning objectives’ (UMUC). The presence of design examples is flagged at homepage level on four of seven sites and accurately signposted in three cases only (COTC, DELTA, LD).

In terms of underlying purpose and target audience, there seems to be lot more common ground. The main problem here is teasing out the details which are not always spelt out. The intended audience is university teaching staff, specifically named on six out of seven sites and implicitly understood on the seventh (DELTA). The overall purpose is clearly stated on LD, UMUC and DP sites and in background literature for DELTA and COTC (Holt et al., 2005; Brack et al., 2005). Similar aims are implicit in the directions that DS and TwT sites provide to teaching staff users. The main elements are:

- Professional development for teaching staff
- Using flexible delivery
- Addressing pedagogical challenges and opportunities raised by new ICTs
- Viewing exemplary models of ICTs in teaching use

The critical question here is the precise meaning of the word ‘view’, particularly in the context of a process that is supposed to result in learning, whether that of students or teaching staff. Provision of learning media may be a starting point for learning, but it is not the whole story. Explanations available on the sites themselves tend to be variations on the concept of ‘view’ without much further detail. Users are told to ‘explore’, to ‘engage’ and to ‘access’. On the DPT site, there are full instructions for constructing new designs but little on what might be done with the examples already there. UMUC gives the clearest viewing directions, with an online course-book style layout that leads the viewer through the whole site from start to finish. A comprehensive viewing of similar extent is required in the other six sites in order to reach a meaningful overview, due to the opacity of the menus offered. The only way to get an idea of what the menu range represents is by immersion in the content beneath. Every gallery operates in course book style, where careful study of the whole is necessary for understanding of the parts. By making the process explicit, UMUC provides its viewers with the easiest navigation of the seven. Here, the viewer knows where to start and where to end.

The galleries have the outward trappings of twenty-first century web design but the language and conceptual architecture belong to another world altogether. Their prototype is to be found in a Victorian invention: the instructive collection of exemplary works of art, as seen in Ruskin's Teaching Collection (Hewison, 1984: 9-35). Shared features include: content based on works of exemplary quality, sorting and cataloguing based on didactic purpose, the intention that the collection function on its own as an instructive experience, not just an adjunct to organised classes, and finally, the need for viewers to work through the collection in a sustained, studious manner, as would happen in the regular classroom, in order to realise the intended benefit. The ED galleries are basically about improving teaching practice by exposing teachers to ‘good practice’ exemplars using a tried and tested model of mass instruction.

The casting of teachers in the role of instructional target implies the presence of a second type of agent, equally important for the galleries' instructional mission: an instructional source. Where does the instructional message come from? Who is really teaching the teachers here? Ideally, we should be able to say that the galleries speak on behalf of the collective experience and expertise of the educational design discipline. If there were such thing as an educational design discipline or a coherent body of disciplinary knowledge integrating the collective experience of design practice, galleries of exemplary educational design work would be their natural home. On the evidence of current ED galleries, however, educational design is in a very early developmental phase as a discipline and unable to articulate any coherent identity of its own. Collective disciplinary knowledge is certainly not the main source of authority in this case. What else could it be?

The main authority evident on gallery homepages is that of their sponsoring universities and government bodies. Here is the common core of instructional identity in the seven ED galleries, the easy self-assurance of agencies well-practiced in telling teachers what to do. Being in confident command of their local situation, however, is not the same as being ready to state their business in clear, precise terms for a global web audience. This requires another kind of boldness altogether. The authorial voice of the ED galleries speaks from somewhere on the boundary between teaching administration and frontline teachers but without any indication of precise location in relation to either. The craft of educational design and its practitioners remain shadowy outlines behind the gallery exhibits, glimpsed from the web interface as if ‘through a glass darkly’, like lurkers in their own digital display.

Conclusion: Try harder? Try what?

The original aim in undertaking this paper was finding a better framework for identifying educational problems and solutions: a taxonomy of something that has been called ‘educational design’ for want of a better term. An obstacle to this goal has emerged in the naming strategies of existing classification schema. These tend to favour division and hierarchy between roles of teaching and educational design rather than providing language of common understanding. The essential requirement for getting around this obstacle is to find ways of naming that make shared sense. This takes us back to the original starting point, the search for a better taxonomy.

Finding an actual working taxonomy is still a distant goal. However, the requirements for getting there have become a bit clearer. The main requirement is foundation in teaching context. The categories need to make sense in terms of the curriculum structures that teachers work with, not just in terms of pedagogical ideals. The second requirement is a focus on elements of the teaching curriculum that are neglected or overlooked, as workplace learning appears to be in current ED galleries. The deepest structural divisions are the ones taken for granted. Third, the process of taxonomy development needs to start from a position of neutrality in regard to the question of what may or may not constitute an example of good teaching practice. Taxonomy developers need to be wary of the trap seen in the ED galleries where focus on a limited range of ‘good practice’ examples leads to classification systems confined solely to the cases represented by those examples, which in turn limits the possibility finding a broader range of examples.

Broader implications for pedagogical theory and educational philosophy must be left for further investigation. The question of whether the current tools of educational theory are up to the task of ED gallery construction, or whether some sort of rethinking of educational theory itself is required, is outside the scope of this paper. In the meantime, the existing ED galleries stand as leading models of their kind and are entitled to acknowledgement of their pioneering efforts. Those who believe that a better architecture exists in theory now have some benchmarks against which to test their ideas in practice.

References

AUTC. (2003a). *Learning Designs: products of the AUTC project on learning designs.* http://www.learningdesigns.uow.edu.au/ [viewed 26 June 2006].

AUTC. (2003b). *Reusable Learning Designs: opportunities and challenges, 5th December, 2002.* http://www.iml.uts.edu.au/autc/ [viewed 19/7/2006].

Bloom, B. S., Kratwohl, D.R., & Masia, B.B. (Eds.). (1964). *Taxonomy of educational objectives: the classification of educational goals / by a committee of college and university examiners*. London : Longman.

Brack, C, Samarawickrema, G & Benson, R. (2005). Technology advances: Transforming university teaching through professional development, in Brew, A. & Asmar, C. (Eds) *Higher Education in a changing world. Research and Development in Higher Education, 28. Proceedings of the 2005*

HERDSA Annual Conference. Sydney Australia 3–6 July. http://conference.herdsa.org.au/2005/pdf/refereed/paper_306.pdf [viewed 26/06/2006].

Buzza, D.C., Bean, D., Harrigan K. & Carey, T. (2005). Learning design repositories: Adapting learning design specifications for shared instructional knowledge, *Canadian Journal of Learning and Technology*, 30(3).

Baudrillard, J. (1981). *Simulacres et Simulation*. Paris: Editions Galiée.

Carrick Institute for Learning & Teaching in Higher Education. (2006). *Resource Identification Network (RIN)*. http://www.carrickinstitute.edu.au/carrick/go/pid/104 [viewed 19 Jul 2006].

Conole G. & Fill, K. (2005). A learning design toolkit to create pedagogically effective learning activities. *Journal of Interactive Media in Education*, 2005 (08). jime.open.ac.uk/2005/08 [viewed 27 July].

Deakin University, Deakin Studies Online. (2005). *Contemporary Online Teaching Cases.* http://www.deakin.edu.au/itl/teach-learn/cases/ [viewed 26 June 2006].

DialogPlus. (2006). The DialogPlus Toolkit. http://www.nettle.soton.ac.uk//toolkit/Default.aspx [viewed 25 June 2006].

Educational Technologies at Virginia Tech. (2006). DesignSHOP. http://www.edtech.vt.edu/edtech/id/index.html [viewed 26 June 2006].

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology*, 21(1), 82–101. http://www.ascilite.org.au/ajet/ajet21/goodyear.html [viewed 19 Jul 2004].

Harper, B., Oliver, R., & Agostinho, S. (2001). Developing generic tools for use in flexible learning: A preliminary progress report. In G. Kennedy, M. Keppell, C. McNaught & T. Petrovic (Eds.), *Meeting at the Crossroads. Proceedings of the 18th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education*. (pp. 253–262). Melbourne: Biomedical Multimedia Unit, The University of Melbourne.

Hewison, R. (Ed.). (1984). *The Ruskin Art Collection at Oxford: Catalogue of the Rudimentary Series, in the arrangement of 1873, with Ruskin's comments of 1878*, London: Lion and Unicorn Press, pp. 9–35.

Holt, D., Borland, R., Farmer J., Rice, M. & Mulready, P. (2005). Casing out teaching and learning online: Enhancing fidelity into the mainstream. H. Goss (Ed.), *Balance, fidelity, mobility: Maintaining the Momentum? Proceedings of the 22nd Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education* (pp. 261–270). Brisbane: Teaching and Learning Support Services, Queensland University of Technology. http://www.ascilite.org.au/conferences/brisbane05/proceedings.shtml [viewed 19 Jul 2004].

Ip, A. & Naidu, S. (2001). Experienced-based pedagogical designs for elearning. Educational Technology, 41(5) September-October Special Issue on 'Knowing the Web'. pp. 53–58.

Jonassen, D.H. (2000). Toward a design theory of problem solving. *Educational Technology, Research and Development*, 48(4), 63–85.

Krug, S. (2000). Don't make me think: A common sense approach to web usability. Berkeley, CA: New Riders Publishing.

McNaught, C., Burd, A., Whithear, K., Prescott, J. and Browning, G. (2003). It takes more than metadata and stories of success: Understanding barriers to reuse of computer facilitated learning resources. *Australian Journal of Educational Technology*, 19(1), 72–86. http://www.ascilite.org.au/ajet/ajet19/mcnaught.html [viewed 19 Jul 2006]

Mayes, T. & De Freitas, S. (2004). *Review of e-learning theories, frameworks and models, Stage 2 of JISC e-Learning Models Desk Study*. http://www.jisc.ac.uk/uploaded_documents/Stage 2 Learning Models (Version 1).pdf [viewed 19 Jul 2006]

Monash University, Centre for Learning & Teaching Support (2004). *DELTA - Designing Electronic Learning and Teaching Approaches*. http://muso.monash.edu.au/webct/cobaltMainFrame.dowebct [Secure site – viewed 10 July 2005]

Oliver, R., Harper, B., Hedberg, J., Wills, S., & Agostinho, S. (2002). Formalising the description of learning designs. In A. Goody, J. Herrington, & M. Northcote (Eds.), *Quality conversations: Research and Development in Higher Education*, Volume 25 (pp. 496–504). Jamison, ACT: HERDSA.

Samarawickrema, G., & Benson, R. (2004). Helping academic staff to design electronic learning and teaching approaches. *British Journal of Educational Technology*, 35(5), 659–662.

University of Maryland University College. (2005), *UMUC-Verizon Virtual resource site for teaching with technology*. http://www.umuc.edu/virtualteaching/ [viewed 26 June 2006].

University of Minnesota. (2006). *Teach with Technology*. http://dmc.umn.edu/teach.shtml [viewed 26 June 2006].

Wozniak, H., Mahony, MJ, Everingham, F., Poulos A. & Reid, B. (2005). Inquiry based learning in the health sciences: Countering the limitations of 'Problem Based' Learning. *Focus on Health Professional Education: A Multi-Disciplinary Journal*, 7(2), 18–30.

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Reusing learning designs: Role play adaptations of the Mekong and Ha Long Bay e-Sim

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This paper reflects on the reuse and adaptation of a learning design in a different university context and in migrating from one lecturer to another. Building on and adapting the learning framework of the Mekong e-Sim (McLaughlan et al., 2001) the Ha Long Bay e-Sim forms the major assignment for students enrolled in the third year unit GEOS311 Asia Pacific Development (Department of Human Geography, Macquarie University). The e-Sim is a structured web-based role-play simulation designed to develop learners' understanding of the multiple perspectives on issues related to development and conflict over the use of resources within the world heritage site of Ha Long Bay, Vietnam. This paper examines the experience of both the lecturers and students as the e-Sim was adapted over a four year period to meet changing student needs and a different university context, including reuse within a new operating environment and a diverse student base. Student perceptions of learning outcomes are analysed, revealing a positive response to the learning experience. The paper concludes with some recommendations on the reuse of an e-Sim learning design and identifies research and development questions for further investigation.

Keywords: learning design, online role play, Mekong e-Sim, reusability, migration

Introduction

The Ha Long Bay e-Sim is a structured role-playing web-based simulation forming the major assignment for students enrolled in Asia Pacific Development (GEOS311, Macquarie University). Adapted from the successful learning design of the Mekong e-Sim (McLaughlan, Kirkpatrick, Maier & Hirsch, 2002), the Ha Long Bay e-Sim is an example of how learning designs can be reused not only across institutions but from one lecturer to another. This paper examines the adaptation and reuse of this learning design in a different university and program context and reflects on the experience of both the designer and students involved. It begins by outlining the original online role play, the Mekong e-Sim, and then reflects on the key changes made over a four year period in order to reuse the design in the form of the Ha Long Bay e-Sim, taking into account a new operating platform, curriculum context, the needs of a different student base, and changing course convenors. A discussion of the adapted e-Sim's evaluation and student perceptions of learning outcomes are analysed, and the paper concludes with some recommendations on the reuse of a learning design.

The Mekong e-Sim: Best practice role play

The Mekong and Ha Long Bay e-Sims incorporate Information Communication Technology (ICT) into a role play simulation, as represented in a range of best practice examples (Vincent, Shepherd & Viet, 2002; McLaughlan & Kirkpatrick, 1999; McLaughlan et al., 2001). The Mekong e-Sim utilized unique design features to increase and facilitate student online interaction and debriefing (McLaughlan Kirkpatrick, Maier & Hirsch, 2002). Recognized as best practice[i], the Mekong e-Sim used ICT to allow the conventional face-to-face role play timeframe to be extended and played out partly within student-determined timeframes. This provided greater opportunity for reflection and technical analysis of options during decision-making by the participants, and also a written record of the interaction. Students who would otherwise be restricted by time or distance were now able to participate (McLaughlan & Kirkpatrick, 2001). The Mekong e-Sim was constructed around four stages: briefing, interaction, forum, debriefing (for details on these stages see McLaughlan et al, 2001; 2002). Throughout these stages students learnt about their adopted role, the setting of the simulation and the issues that created interdependence between them. The first author was involved with the running of the e-Sim at the University of Sydney and upon beginning her lectureship at Macquarie University was interested in reusing the learning design in this new context.

Reusing the learning design – the Ha Long Bay e-Sim

Situated within the Department of Human Geography at Macquarie and with encouragement from the Mekong e-Sim designer, Rob McLaughlan, Lloyd began the process of adaptation with assistance from a Macquarie University teaching development grant and IT support from the Centre for Flexible Learning. In its new form the Ha Long Bay e-Sim forms the major assignment for students enrolled in *GEOS311 Asia Pacific Development*. This four credit point course deals with processes and consequences of development in the Asia Pacific region. The e-Sim focuses on one specific international problem related to the conflict over resources in the world heritage site of Ha Long Bay, northeast Vietnam. Students are expected to allocate at least twelve hours per week for this activity and the assessment comprises thirty five percent of their grade. Approximately 30–40 students enroll in the course each year, drawn from a range of disciplines including human geography, education, law, resource and environmental management and business. A substantial number of these students are enrolled externally and are distributed throughout Australia.

Like the Mekong e-Sim, the Ha Long Bay simulation aims to develop a range of skills, including students' awareness of the social implications of their discipline, a greater understanding of teamwork and cross-cultural perspectives, the ability to use ICT effectively, and a critical capacity to deal with complexity and ambiguity (McLaughlan *et al.*, 2001). In particular, the e-Sim enabled the participation of external students who often miss out on group-based activities and the skills that come as a result of this.

The Ha Long Bay e-Sim continues with the structural approach of four stages, beginning with students researching their adopted persona, ranging from industry and community groups to government and international organisations, and key issues surrounding the scenario. An online public inquiry takes place that is designed to trigger interaction between the persona, with each required to respond to a development dilemma. The event is modelled on a real situation and is supported by online resources, for example, media reports and government documents, which the persona draw on to inform their decisions. Learning occurs at all stages but particularly as a consequence of participants engaging with the scenario through a range of assessment tasks, as well as reflection upon the interactions between participants (Lloyd, 2004).

The challenges of reuse and migration

The following were the key adaptations made in the original migration of the Mekong e-Sim, to the Ha Long Bay e-Sim at Macquarie University. First, the Mekong e-Sim used the Learning Management System (LMS) *Blackboard* as its main platform while at Macquarie University WebCT is used. While both systems allowed for sending e-mail, text chat, and threaded discussion forums, the facilities for setting up group work areas differed and this required the restructuring of group communications. Second, to meet Macquarie University's diverse student needs (international and external as well as internally-based students) and to correlate with the assessment requirements and structure of the unit, the length of the e-Sim was extended from four to seven weeks. A significant adaptation associated with this lengthening was the inclusion of an e-Sim related question in the exam. This aims to ensure that all participants engage in the e-Sim as there are individual assessment criteria as well as a group mark. However, the overall number of assessment components have been scaled down, making it more manageable. Third, as the e-Sim focused on a different scenario, new supporting materials, personas and events had to be developed within a short time frame. This was made possible by financial assistance from a Macquarie University teaching development grant. One of the key challenges in the sustainability of the e-Sim is the constant need to update resources, requiring time and finances.

In 2006 the unit was convened by a new lecturer and saw a process of further adaptation. The handover took place over a three month period and involved familiarisation with the technical components and the resources. Follow up meetings consisted of further detail as to the running of stages and assessment components. The previous convenor was constantly available for consultation during the running of the e-Sim. In areas that had been previously identified as challenges, specific adaptations were made. This included streamlining the assessment through making particular components pass/fail only. The importance of group work was emphasised and subsequently time spent on team preparation was increased and an assessment component comprising self reflection on group dynamics and conflict resolution strategies was incorporated. A particular assessment question was refined to emphasise participants' need to develop empathy with their persona.

Student learning and perceptions

The Ha Long Bay e-Sim has been evaluated on its design and implementation over the four years it has run (2003–2006). The following is an overview of the responses to the online survey in 2003. Results indicated that students either strongly agreed or agreed that the e-Sim:

- developed negotiation skills (90%); problem solving skills (66%); and sharpened analytical skills (76%)
- helped to develop the ability to work as a team member (86%)
- improved skills in electronic communication (e.g. email, discussion forum) (81%)
- developed their ability to seek and utilize knowledge from a range of sources (72%)
- contributed to greater confidence to work in an international environment (72%); and a 'virtual environment' (90%)
- developed awareness of the political, social and economic dimensions of decision-making in the Ha Long Bay region (95%); and knowledge of organizations involved in development of the Ha Long Bay region (96%)
- developed awareness of the values and attitudes of persona (100%) and other personae (95%)
- developed the ability to see development issues from multiple perspectives (95%)
- was enjoyable (86%).

Responses to the open ended question about what the student found most useful / enjoyable about the e-sim also provide further support for the e-sim's role in contributing to student learning. One student responded "I enjoyed the whole experience. Got a lot more out of it than any essay could provide". Another stated that "I found the most enjoyable aspect of the e-sim was that it was a unit of work that was entirely different than what I had done previously at uni. It was a welcome change than just writing out straight essays or critiques". Therefore moving the focus from essay-based assessment was valued by students and added to their learning experience. As another student said: "Well done for finding a new way to help us learn…it was interesting and great to see everyone take it so seriously and yet have fun at the same time".

Another key objective of the e-sim was to increase the ability of external students to engage in group work with others in the course. One external student stated that they enjoyed the "constant communication with others...as an external this is vital so you feel like you always know what's going on on-campus". In general the students noted that the WebCT platform was useful in allowing external and internal students to communicate and work as a team. As another external student noted: "I found that the Web CT extremely useful as I was easily able to gather the information. It also made life easier trying to contact other group members which is always difficult for external and part-time students who are generally very hard to contact." For a more detailed discussion on evaluation results see Lloyd (2004).

Conclusion

The Ha Long Bay e-Sim provides a case study of how a best practice learning framework can be reused and migrated for effective learning in a new context. The initial migration from the University of Sydney to Macquarie University saw a significant adaptation to new technological and institutional requirements. Specific modifications included an extended timeframe for the activity, new stages and integration of the final debriefing stage into the final exam, new resources and online supports. The convening of the unit by a new lecturer saw a further process of refinement in assessment and preparation. This process has affirmed that, as a learning design, the e-Sim is robust and sustainable given appropriate preparation time and support. In terms of recommendations the authors would suggest the following:

- The migration and reuse of the e-Sim was only possible with institutional financial assistance and support from designers and experienced users. Preparation time is crucial for a smooth transition.

- It facilitates the process if convenors are computer literate, experienced with e-learning platforms and enthusiastic about this type of learning design.
- Further research could take place to assess the quality and quantity of the learning from the e-Sim as opposed to more traditional essay-based learning.
- We would recommend an audit of time invested in the development, running and evaluation of the e-Sim to ascertain if it is sustainable and justified by the quality of the learning outcomes.

References

Lloyd, K. (2004). Playing Games with conflict: the Ha Long Bay e-sim, *Acquiring and Constructing Knowledge Through Human–Computer Interaction: Creating New Visions for the Future of Learning* pp171–178, McKay, E. (ed). International Conference on Computers in Education 2004, Melbourne, 30th November – 3rd December 2004 ISBN: 1863355731

McLaughlan, R. G. & Kirkpatrick, D. (1999). A Decision Making Simulation using Computer Mediated Communication. *Australian Journal of Educational Technology*, 15(3), 242–256 http://cleo.murdoch.edu.au/ajet/ajet15/mclaughlan.html,

McLaughlan, R., Kirkpatrick, D., Hirsch, P. & Maier, H. (2001). Using Online Roleplay/Simulations for Creating Learning Experiences. *CAL-laborate*, October, 23–25.

McLaughlan, R.G. & Kirkpatrick, D. (2001). Peer Learning Using Computer Supported Roleplay-simulations, in Boud, D., Cohen, R. & Sampson J. (Eds), *Peer learning in higher education: Learning from and with each other*, 141–155, London: Kogan Page.

McLaughlan, R., Kirkpatrick, D., Maier, H. & Hirsch, P. (2002). Description of Mekong e-Sim: An online role-play simulation about international natural resource management issues. Retrieved March 11, 2004, from Learning Designs Web site: http://www.learningdesigns.uow.edu.au/exemplars/info/LD42/index.html

Vincent, A., Shepherd, J. & Viet, R. (2002). Description of Macquarie University Middle East Role-Play Simulation about Politics. Retrieved March 11, 2004 , from Learning Designs Web site: http://www.learningdesigns.uow.edu.au/exemplars/info/LD3/index.html

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[i] The Mekong e-Sim was awarded a number of accolades. These include the ascilite award for Best Web Project 2001; UniServe National Science Teaching Award 2002; Commonwealth of Learning Excellence for Distance Educational Materials (EDEA), 2002.

Educational animation: Who should call the shots?

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Despite the increasing popularity of animation for explaining dynamic subject matter, research shows it is not uniformly beneficial for learning. User control has been suggested as a way to enhance learning by ameliorating negative effects of animation. However, giving learners the responsibility for controlling how an animation presents its information does not always produce the anticipated benefits. It appears that the associated interrogation tasks can over-tax learners' internal processing resources so that extraction of relevant information is prejudiced. More prescriptive animation presentation regimes may be superior to free user control, particularly for learners who are novices in the depicted domain.

Keywords: animation, user control, learning, interrogation strategies, complex content

Introduction

Current information and communications technology greatly facilitates the authoring, display and distribution of dynamic graphics. As a result, electronic learning environments that include animations amongst their educational resources increasingly feature in university teaching. The technological sophistication of animations used in these resources has progressed considerably in recent years to the point where interactive animations are becoming commonplace (Bétrancourt, 2005). One of the most widespread forms of interactivity now being provided with educational animations is user control. The provision of user control has expanded with the advent of display software such as Apple Quicktime and Windows Media Player whose video-like controls allow learners to manipulate an animation's overall playing regime. However, more advanced forms of user control tailored to the specific requirements of particular learning experiences are also possible by using dedicated animation software such as Flash.

Whose technology… whose control?

As is often the case with educational technology, the adoption of user control appears to be driven more by technical feasibility than by well-formed ideas or research-based insights about its possible consequences for learning. The relatively unquestioning uptake of user control suggests its proponents have a gut-feeling that there must be an intrinsic educational benefit involved. Leaving aside affective issues such as the positive effects that user control may have on learner feelings of self-efficacy, convincing arguments can be made for the provision of user control in terms of perceptual and cognitive advantages that could result for learners. The nature of these potential advantages can be understood by comparing the perceptual and cognitive demands of traditional system-controlled animations (as presented by film or television) with today's user controllable computer-based animations. Traditionally, the playing regime of animations presented via these media was essentially fixed because of fundamental technical limitations of the display system. There was effectively no possibility for individual viewers to alter the course of an animation's presentation to suit their own requirements. While such system-controlled animations have proven highly successful when the goal is entertainment, research suggests that success is by no means guaranteed when they are used for educational purposes (Tversky, Morrison, & Bétrancourt, 2002). When learning is the goal, the characteristics of the target audience are fore-grounded and the opportunity to modulate presentation of animated information to suit these characteristics becomes a central design issue

If to-be-learned subject matter is presented by a system-controlled animation, the fixed playing regime can result in mismatches between the way dynamic information is presented and the learner's capacity to process that information effectively. This type of mismatch is probably clearest in cases where the animation's content is relatively complex and is presented too quickly for the learner to process all relevant aspects of the displayed information in the time available. The fundamental difficulty here is that animation is a transitory way of representing information. Animations create their dynamic effect by the rapid sequential display of a series of frames depicting varying information. In order to sustain the illusion of continuous change, each frame of information must be displayed for no longer than a fraction of a second. With system-controlled animation, the sequence of frames is typically presented once only, from beginning to end, and at a constant pre-determined speed. However, this regime makes no allowance for the fact that the demands of extracting and interpreting the presented information vary throughout the course of an animation according to factors that include the information's density, novelty, and degree of interrelation. At particular points in the animation, the conjunction of such factors may raise the demands to a level that is beyond the capacities of the learner's limited perceptual and cognitive processing resources. Unless the values of presentation parameters are modified to reflect these changing demands on the learner, it is likely that *overwhelming* (Lowe, 2005) will result because processing capacity is exceeded. As a result, learning will be compromised. In the next section, we consider the consequences of providing user control in order to address the problem of lack of flexibility in an animation's playing regime.

Who's *not* learning from user control?

User control appears to offer an elegant solution to this problem by allowing individual learners to personalize the playing regime through manipulation of aspects such as the speed, direction, continuity, and frequency of presentation. The assumption here is that learners will be able to make the animation more tractable by matching its presentational characteristics to their own processing capacities. Indeed, when the type of subject matter involved is relatively familiar and straightforward, user control over the presentation of dynamic visual instruction can be highly beneficial to learners (Schwan & Riempp, 2004). However, benefits are far less likely when learners who are novices in the depicted domain are faced with animations that present complex subject matter (Lowe, 2004b). Under these circumstances, the mere *provision* of user control does not necessarily result in its effective use. Although learners who are domain novices certainly take advantage of the user control provided to make the animation more tractable, they are likely to do this in a way that prejudices effective exploration of the available information.

Research indicates two potential sources of problems domain novices can have in learning from animation that incorporates a high level of user control. First, the delegation of control over an animation's presentation regime to learners imposes an additional task on them that eats into their limited perceptual and cognitive processing resources. Ideally, as much as possible of a learner's processing capacity should be devoted to activities centrally concerned with building a proper understanding of the subject matter. However, demands from the peripheral activities of using the control facility and interrogating the animation in an attempt to extract the required information are inconsistent with this ideal (Bouchiex, in press). Second, the results of learners' interrogation of a user-controllable animation are likely to be relatively poor due to inappropriate targeting of information and sub-optimal exploration strategies. Each of these potential problems will now be discussed in turn.

Knowing where to look and when to look

When learners lack background knowledge about the domain from which the depicted subject matter is derived, they tend to target information that is superficially conspicuous, irrespective of its underlying importance (Lowe, 1999, 2004a). This can result in two related effects that have serious negative consequences for learning: (i) the neglect of aspects that are highly relevant to the learning task but have low perceptual salience relative to the rest of the display, and (ii) inappropriate allocation of attention to more perceptually salient aspects that are in fact of low thematic relevance. Put more starkly, worthwhile information is passed over in preference to information that is worthless, or possibly dangerous. While such problems also occur with static graphics due to misleading visual cues about relative importance, they appear to be considerably more severe with animations because *dynamic contrasts* (Lowe, 2005) within these displays can be so compelling with regard to perception. The immediate effect of learners following misleading perceptual cues as a consequence of being given user control over an animation is that they can fail to look in the right place at the right time. Their misplaced and mistimed interrogation efforts mean that key information necessary for a proper and coherent understanding of the presented subject matter is simply not encountered. Further, some of the perceptually conspicuous but thematically irrelevant information they do manage to extract can actually prejudice development of the required understandings (Lowe, in press).

This type of failure in learners' free interrogation of user controllable animations suggests that they may need some form of guidance in how to explore such presentations more effectively. Lowe and Schnotz (2006) investigated the effectiveness of accompanying narrations as a way of providing support for more strategic interrogation of complex animations that depict unfamiliar content. Comparison of interrogation data and eye tracking results revealed that while there was some tendency for general exploration behaviour via the user control facility to be directed towards more task-relevant temporal segments of the animation, learners varied considerably in the effectiveness of their physical search strategies. In addition, there was evidence that unless these strategies were both comprehensive and closely coupled with appropriate visual search behaviour, perceptually subtle information of high relevance to the learning task was likely to be missed. In essence, these findings suggest that even with a high level of guidance, learners may employ user control in a relatively ineffective manner when the animation depicts demanding subject matter. Considering that most current implementations of user control within educational resources do not even attempt to support more productive learner interrogation of animation, the findings raise important questions for those who design and develop such materials. A central question is whether or not user control should be provided for animations at all, and if so, how it could be made more effective.

User control – out of control

A possible but currently unfashionable alternative to the provision of user control would be to provide learners with animations that completely pre-determine how the presented subject matter is encountered. The rationale for this suggestion is that novices tend to be singularly ill-equipped for the rigours of interrogating complex, unfamiliar dynamic information presentations. Instead of leaving learners to struggle with the demands of trying to locate, extract, and interrelate task-relevant information, it may be better to use a more prescriptive approach that does away with these demands. This would require a far more analytical approach to the design of educational animations than is currently the case. At present, the 'end' of the main design and development phase is generally signalled by the production of a completed animation portraying the chosen dynamic content essentially as requested by the subject matter expert. However, in the alternative approach being suggested here, this would be perhaps just the first stage of a far more comprehensive process. Once this initial version had been generated, the instructional design work could start in earnest. It would begin with a systematic identification and clarification of the various information processing demands that the animation as it stands may pose for the target learners. This analysis would constitute the basis for design decisions about how the initial version should be modified in order to make task-relevant information more accessible to the learner. For example, it could be decided to present some key aspects of the dynamic content repeatedly and separately rather than simply showing them once in context. Further, if any of these key aspects possessed a hierarchical dynamic structure, perhaps the repeated presentations could be made at different speeds to reveal the various events and sub-events from which this structure was composed.

The tailored approach being canvassed here would undoubtedly be more time-consuming and costly than present approaches, partly due to the background work that needs to be done in order to make informed decisions about design of the presentation regime. Perhaps the message here is that we need fewer animations but ones that are more effective in supporting quality learning. This would involve a re-allocation of resources rather than an increase. A possible impediment to the suggested approach is that our knowledge about how learners process animated information under different conditions is still in its infancy. The author is currently carrying out investigations with animations of systems having a high degree of dynamic complexity in which tightly structured presentation regimes are provided for learners. These regimes involve separate and specific targeting of different levels of dynamic information within the animation. The approach is to use different combinations of fast and slow playing speeds during a series of repeated passes through the animation. Preliminary indications are that the different regimes lead to learners extracting distinct sets of information from the animation (c.f. Fischer, Lowe, & Schwan, 2006).

More controlling user control

Rather than completely abandoning user control, a middle road could be to take an approach that provides the learner with a measure of freedom in exploring the displayed information but does so within a fixed overarching presentation structure. This clearly cannot be provided by the very generalised approach to user control of essentially dropping an animation into the type of existing control shell that is provided by

Quicktime or Media Player. However, software such as Flash that is specifically designed for authoring interactive animations could be used to generate presentations which give more emphasis to high relevance aspects of the dynamic information than to those that are less crucial to the learning task. A key consideration in shaping an effective animation exploration environment for learners would be how high relevance information was emphasised and low relevance information suppressed. The dynamic character of animated presentations provides many opportunities for such shaping that are not available with static depictions. This constitutes a most productive area for both research and development.

References

Bétrancourt, M. (2005). The animation and interactivity principles in multimedia learning. In R.E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (pp. 287–296). New York: Cambridge University Press.

Bouchiex, J-M. (in press). Young learners' interaction with technical animations: User control and attentional cues To appear in R.K. Lowe & W. Schnotz (Eds.) *Learning with animation: Research and implications for design*. New York: Cambridge University Press.

Fischer, S., Lowe, R.K., & Schwan, S. (2006, July). *Effects of presentation speed of a dynamic visualisation on the understanding of a mechanical system*. Paper presented at the CogSci 2006, the 28th Annual Conference of the Cognitive Science Society, Vancover, Canada.

Lowe, R.K. (1999). Extracting information from an animation during complex visual learning. *European Journal of Psychology of Education, 14*, 225–244.

Lowe, R. K. (2004a). Interrogation of a dynamic visualisation during learning. *Learning and Instruction, 14*, 257–274.

Lowe, R.K. (2004b). User-controllable animated diagrams: The solution for learning dynamic content? In A. Blackwell, K. Marriot, & A. Shimojima (Eds.), *Diagrammatic representation and inference* (pp. 355–359). Berlin: Springer-Verlag.

Lowe, R.K. (2005). Multimedia learning of meteorology. In R.E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (pp. 429–446). New York: Cambridge University Press.

Lowe, R.K. (2006). Changing perceptions of animated diagrams. In D. Barker-Plummer, R. Cox, & N. Swoboda (Eds.), *Diagrammatic representations and inference*. (pp. 168–172). Berlin: Springer.

Lowe, R.K. (in press). Learning from animation: Where to look, when to look. To appear in R.K. Lowe & W. Schnotz (Eds.) *Learning with animation: Research and implications for design*. Cambridge University Press.

Lowe, R.K. & Schnotz, W. (2006, April). *What type of narrations do animations need?* Paper presented at the annual conference of the American Educational Research Association, San Francisco.

Schwan, S., & Riempp, R. (2004). The cognitive benefits of interactive videos: learning to tie nautical knots. *Learning and Instruction, 14*, 293–305.

Tversky, B., Morrison, J.B., & Bétrancourt, M. (2002). Animation: Can it facilitate? *International Journal of Human-Computer Studies, 57*, 247–262.

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Is role-play an effective teaching approach to assist tertiary students to improve teamwork skills?

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Often student teams become dysfunctional as a result of inexperience and lack of prior knowledge. This exploratory study implements and evaluates a framework that attempts to scaffold teamwork skills through role-play activities. The review highlighted five essential teamwork skills that are supported with teaching materials. The results indicated that measuring change in team performance is difficult. However, the study showed that role-play was an effective teaching approach and well received by the students.

Keywords: teamwork, role-play, skills development, graduate attributes, communication skills, active listening, decision making, interdependence, interpersonal skills, conflict resolution

Introduction

There is a growing emphasis in higher education institutions on students developing professional skills that can be directly applied in industry. Important areas such as the development of teamwork skills, problem solving skills, decision-making skills, communication skills and information literacy skills have been given greater priority in response to industry requirements and greater reliance on teamwork within organisations (Australian National Training Authority, 2000; Baker, Horvath, Campion, Offermann & Salas, 2005; Bennett, Dunne, & Carre, 1999; Candy, Crebert, & O'Leary, 1994; Dearing, 1997).

Edith Cowan University (ECU) has ten graduate attributes that are considered important to a student's overall development and teamwork is identified as an essential generic skill. For this reason in many courses at ECU, students are required to work in teams as part of the curriculum. However, they are only given limited guidance as to how to make this effective. Sometimes students feel frustrated with these teamwork activities and complain about inequitable workloads and conflict. Students do not learn much from participating on dysfunctional teams and often develop negative views about the value of teamwork (Denning, 1992; Luca & Heal 2006; Swan, Magleby, Sorensen & Todd, 1994).

Teamwork

Handling group dynamics, multicultural teamwork, developing team presentational skills and implementing peer assessment are essential principles for effective teamwork according to Oxford Brookes University (2005). According to Luca and Tarricone (2001), the essential skills are commitment to team success and shared goals, interdependence, interpersonal skills, open communication and positive feedback. Similarly according to Harris and Harris (1996) team members should be willing to give and receive constructive criticism and provide authentic feedback, as appropriate team composition is essential in the creation of a successful team. Team members need to be fully aware of their specific team role and understand what is expected of them in terms of their contribution to the team and the project; commitment to team processes (Kets De Vries, 1999); and leadership and accountability, where team members need to be accountable for their contributions.

The review highlighted very similar areas, but it was seen as an important prerequisite of this study to find a valid and reliable instrument that could measure teamwork skills and attitudes. This turned out to be harder than originally anticipated given the relevance and importance that teamwork skills play in the current tertiary environment. Most instruments were commercial and expensive to use. The only suitable instrument found from a known reliable source was the Adult Literacy and Life skills (ALL) teamwork framework instrument (Baker et al., 2005). The ALL Survey is an international comparative study designed to provide participating countries, with information about the skills of their adult populations.

ALL undertook their own in-depth research in four core competencies - communication, interpersonal relations, group decision making/planning and adaptability/flexibility. It was decided to base our teaching materials on these, with the inclusion of conflict resolution, as this was perceived as important from the researchers own review.

Role-play

"Teamwork skills and team member participation can often be enhanced through role-playing" (Lingard & Berry, 2002) as it allows for hypothetical situations to be approached in an authentic setting. This is corroborated by research that concludes that situated learning allows learners to construct their own meaning and improves outcomes (Alessi & Trollip, 2001; Anderson, 1983; Park & Hannafin, 1993; Schank 1997). Applying skills toward achieving a specific goal provides a context in which those skills are useful (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990; Collins, Brown, & Newman, 1989).

According to Johnson, Sutton and Harris (2001) students perceive role-playing as one of the most important techniques for learning communication skills, after discussion. Role-playing scores the highest for the most enjoyable learning environment and since learning is improved if a student is motivated and engaged this is important to their learning outcomes.

Within this context, a role-play intervention was used to help promote the development of students' teamwork skills. Role-play may be situated in authentic settings where students are allowed the opportunity to acquire the intended learning outcomes by making mistakes in safe environments.

Research undertaken by Ip, Linser and Naidu (2001) concluded that the move from traditional lectures, seminars, tutorials, paper-based exams, essay writing and reliance on printed books and articles, to role-playing significantly transformed the learning and teaching processes**.** Students played an active rather than passive role and emphasis was transferred from individual activities to communication and collaboration, which allowed flexibility in the delivery of material in terms of the number of participants, the timing and spatial location of the teaching and learning process and also how participants were taught new skills and competencies.

Methodology

A case study of two student teams, totalling six students was used to test the effectiveness of role-play as an approach to acquiring and or improving teamwork skills and perception of teamwork skills. Five modules were developed, each targeting a specific teamwork skill as outlined in the Literature Review and based on the ALL Teamwork Framework questionnaire (Baker et al., 2005). These students were selected from a unit where they were involved with real clients, producing an authentic product, such as a website or DVD in project teams where each play a real-world role, such as Graphic Designer, Project Manager and so on.

Data was collected in the form of both interview and survey data, which encompassed both quantitative and qualitative data. Surveys were undertaken to attempt to measure any discernible change in skill level, attitude towards teamwork and perception of teamwork skills.

The intervention consisted of five modules. Each module had a learning activity and involved the role-play of both good and bad teamwork skills. In order to highlight the possible pitfalls the researchers role-played the bad scenario first. This was done to put the students at ease and the researchers believe assisted the students in feeling less self-conscious about their own attempts at the good scenario. After the role-play of the bad scenario the students were provided with a teaching package that highlighted the skill being demonstrated, the key principles and techniques and, together with the role-play, provided material for discussion and reflection. The students then undertook a relevant activity based on the information provided and discussed, which was intended to provide scaffolding for their newly acquired knowledge and then a student group attempted to role-play the good scenario, allowing them to apply that knowledge. This then provided further material for reflection and discussion. Students were then required to use this to develop their SAOs (Situation, Action, Outcome) for their e-portfolio.

Preliminary findings

The results did show that the students considered teamwork to be important. This was reinforced by comments made as part of the qualitative data gathered. In response to the question – how do you feel about working in teams at ECU, one student responded, "It is a good experience and I think it is the most important skill to have when going out to the workplace". However, there were changes in the perception of teamwork skills from pre- to post- survey (students were asked to rate their skills in each of the areas). Five out of six of the students felt that their skill levels had improved, but this was not corroborated by the ALL surveys.

Overall the students enjoyed the program, which was evident in their active engagement and aligns with Johnson, Sutton & Harris (2001). When asked about how they felt about role-play and if they found it uncomfortable one student commented:

> Well obviously, but that's really beside the point as I found it really good to learn because you always think you know about that stuff but until you actually try it out… and it's good to role-play because even if you make a mess, you know, it's OK, but if you are actually with a client and you got deadlines then you start figuring out that you should be doing this and it might be a bit too late.

Another student commented on one particular module (interdependence):

> I actually thought that one was really, really good and really enjoyed that one. That taught me a lot about myself and how I conduct myself and in groups, so I thought that was really, really good.

Role-playing also provided an authentic setting where students could apply their new knowledge, "Most of us have been in that group situation before, and so we could sort of relate to that." They found that the information was more readily retained than by other more traditional teaching approaches. For the same reason, as they were able to contextualise the problem they felt that the program assisted with their production of SAOs as it reflected the situation and provided understanding.

Conclusion

This exploratory study attempts to contribute to the development of graduate attributes in the higher education sector by using role-play intervention to help students recognise the importance of teamwork skills, whilst immersed in an authentic learning environment.

It was interesting to discover after all attempts made to use a valid and reliable instrument to measure teamwork skills and attitudes that no discernible change was detected in these areas. This might suggest that the ALL instrument was not suitable for this study, or that it is indeed difficult to measure skill levels with this type of instrument, which was obviously further exacerbated by the small sample size. It would be interesting to perform further research using a much larger sample size to see what impact this would have in using this instrument.

Students highly rated the role-play activities and resources and believed them to be relevant to what they were doing and a motivational learning framework. Feedback obtained from surveys and focus group sessions showed strong and positive engagement in using the role-play strategy and there was an improvement in their perception of their skill levels. This could be a reflection of an improved confidence level provided by the activities undertaken, or it could be that the instruments or methods used do not accurately measure skill levels, or that perceptions are different from actuals, so even though these measures may provide some construct they do not provide conclusive results.

References

Alessi, S. M., & Trollip, S. R. (2001). *Multimedia for learning.* Boston: Allyn and Bacon.

Anderson, J. R. (1983). *The architecture of cognition*. Cambridge: Harvard University.

Australian National Training Authority (1998). *Australia's national strategy for vocational education and training 1998-2003.* Canberra: Commonwealth of Australia.

Baker, D. P., Horvath, L., Campion, M., Offermann, L., & Salas, E. (2005). The ALL Teamwork Framework, Chapter 7. *International adult literacy survey, measuring adult literacy and life skills: New frameworks for assessment*. Canada. Ontario, Statistics Canada**.**

Bennett, N., Dunne, E., & Carre, C. (1999). Patterns of core and generic skill provision in higher education. *Higher Education*, 37(1), 71-93.

Bransford, J. D., Sherwood, R. S., Hasselbring, T. S., Kinzer, C. K., & Williams, S. M. (1990). Anchored instruction: Why we need it and how technology can help. In D. Nix & R. Spiro (Eds*), Advances in computer-video technology, computer, cognition, and multi-media: Explorations in high technology (*pp.115-142). Hillsdale, NJ: Lawrence Erlbaum Associates.

Candy, P., Crebert, G., & O'Leary, J. (1994). *Developing lifelong learners through undergraduate education*. Canberra: Australian Government Publishing Service.

Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In L. B. Resnick (Ed*.), Knowing, learning, and instruction: Essays in honor of Robert Glaser*, (pp.453-494). Hillsdale, NJ: Lawrence Erlbaum Associates.

Dearing. (1997). *Higher education in the learning society*. London: HMSO.

Denning, P. J. (1992). Educating the New Engineer. *Communications of the ACM* 35(12), 83 - 97.

Harris, P. R., & Harris, K. G. (1996). Managing effectively through teams. *Team Performance Management: An International Journal,* 2(3), 23-36.

Ip, A.., Linser, R.., & Naidu, S. (2001). Simulated Worlds: Rapid Generation of Web-Based Role-Play. *The Seventh Australian World Wide Web Conference,* 21st-25th April, Coffs Harbour, NSW, Southern Cross University.

Johnson, D., Sutton, P., & Harris, N. (2001). Extreme Programming Requires Extremely Effective Communication: Teaching Effective Communication Skills Students in an IT Degree. Proceedings of 18th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education at the ASCILITE, University of Melbourne, Melbourne.

Kets De Vries, M. F. R. (1999). High-performance teams: Lessons from the Pygmies. *Organisational Dynamics Winter*, 66-77.

Lingard, R., & Berry, E. (2002). Teaching Teamwork Skills in Software Engineering Based on an Understanding of Factors Affecting Group Performance. *32nd ASEE/IEEE Frontiers in Education Conference,* Boston, MA.

Luca, J., & Heal, D. (2006). Using Role-play to Promote Effective Teamwork. Ed-Media. *World Conference on Educational Multimedia, Hypermedia & Telecommunications*, Orlando, Florida.

Luca, J., & Tarricone, P. (2001). Does emotional intelligence affect successful teamwork? Proceedings of 18th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education at the ASCILITE, University of Melbourne, Melbourne.

Oxford Brookes University. (2005). Guidelines for student group work/teamwork. http://www.brookes.ac.uk/services/ocsd/2_learntch/groupwork.html.

Park, I., & Hannafin, M. (1993). Empirically-based guidelines for the design of interactive multimedia. *Educational Technology Research and Development,* 41(3), 63-85.

Schank, R. (1997). *Virtual learning: A revolutionary approach to building a highly skilled workforce.* New York: McGraw-Hill.

Swan, B., Magleby, M., Sorensen, C., & Todd, R. (1994). Preliminary Analysis of Factors Affecting Engineering Design Team Performance. Proceedings of the ASEE 1994 Annual Meeting, Edmonton, Alberta, Canada, June, 1994.

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Bringing e-learning home: An experiment in embedding e-learning using departmental e-learning advocates

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This paper provides an overview of an innovative project currently being undertaken in English departments in the United Kingdom. The project explores the effectiveness of a departmental or other subject-based unit approach to support for the embedding of e-learning in Higher Education. It seeks to provide answers to the question of how effective and sustainable e-learning practice can be encouraged in a departmental teaching community with a departmental *e-learning advocate*. Their role is to act as both a catalyst for change within a department and a source of practical help and advice for those wishing to make greater use of e-learning. Six departments, representing a range of contexts and modes of 'advocacy', have been selected for the 2006-7 academic year. The project aims to investigate whether we can be smarter about the integration of new technologies at subject level, while at the same time asking questions about the cultures within which academic and teaching communities understand, and come to terms with, the need to change their practice.

Keywords: e-learning support, English studies, embedding, cultural change, staff development

Background

> e-Learning, by its very nature, demands considerably more planning than traditional course development. However, there is little evidence that pedagogy is much considered in this process, with far too many staff seeking to model traditional practice onto e-delivery. Support, at all levels, is often either overlooked or not effectively used. (Stiles & Yorke, 2003, n.p.)

Over the last 6 years the English Subject Centre (one of 24 subject-based units established to support teaching and learning in UK Higher Education) has sponsored 22 different e-learning projects in the English Subject Community. The aim has been to provide both individual lecturers and small teams with financial resources to develop their skills and expertise in the emerging field of e-learning and thereby encourage the cascading of these new pedagogical ideas across their departments and the community as a whole. This kind of support can help to develop innovative practices (Hannan & Silver, 2000).

In 2002 and again in 2005 national scoping studies of e-learning in English Studies in the UK have attempted to discover the uptake, use and perceptions of e-learning in the subject from a practitioner's perspective. After the first study it was noted that given the primacy of the notion of human exchange and interchange, the culture of the subject had not been so quick to embrace the application of IT, and indeed, in some places cultural resistance to the introduction of IT persisted (Hanrahan, 2002). In the three and a half years between the two national studies the uptake and use of e-learning has grown significantly. The 2005 survey, for example, has revealed a high level of use of some form of Virtual Learning Environment (almost 100%), however a lot fewer practitioners appear to be using e-learning to its fullest potential in imaginative, engaging and interesting ways (Lucas, 2006). This is particularly true in areas like the use of discussion fora, the development of literacy or writing skills, improving accessibility to learning materials generally and the development of new forms of online assessment and feedback. These results indicate that sponsoring small-scale innovations in the subject may not be the most effective way to embed e-learning best practice in English studies. E-learning innovations did not appear to be permeating the office walls.

In addition these studies and projects mirror research findings elsewhere into barriers to the uptake of e-learning more generally in higher education (HE), i.e. practitioners' lack of time, technical expertise as well as a lack of understanding of the potential of using these new teaching tools to enhance the student learning experience. Whilst there is widespread recognition of the potential benefits of incorporating e-learning into a range of traditional teaching techniques, and a willingness to share resources that are developed, few English academics are able to find the time to realise their ideas (Lucas, 2006).

E-learning support structures differ widely across HE institutions (Wiles & Littlejohn, 2003; Oliver & Dempster, 2003). Centralised support models commonly revolve around ‘educational development units’ or specialist ‘e-learning teams’ who might work with individual academics in departments across the whole university and who may also second staff to work on designated projects. These units organise workshops, open days and may run accredited e-learning courses. Decentralised approaches include the appointment of faculty or departmental e-learning advisors (usually an existing member of academic staff or learning technologists. Another popular approach is the appointment of ‘e-learning champions’ within an institution who promote the utilisation of e-learning and might support the development of an e-learning related project or initiative in their school. Holtham (2005) however notes the challenges faced in sustaining and developing e-learning champions including work overload, and local dissemination issues. Oliver & Dempster (2003) note that the operational context is important and that there appears no ready model – no single, clearly successful, path – that ensures that e-learning will be embedded.

Although we have no empirical evidence of the extent of support for the embedding of e-learning in all HE institutions in the UK, our impression is that in most cases it is remote and spread too thin to offer the level of ‘hand-holding’ that our academic community needs. Almost all English departments, however, have either an e-learning enthusiast or a group of interested academics some of whom may have pioneered initiatives in e-learning. Could we harness their energy to explore a subject-based approach to e-learning support? The idea of engaging with this diverse group of subject-based academics and using them as advocates of pedagogical change and innovation from within their departments – a bottom-up, holistic view of embedding e-learning – is the central focus of this work-in-progress.

Funding for the project comes from the *Joint Information Systems Committee (JISC) Distributed E-learning Strand*, the aim of which, from a practitioner perspective, is to provide guidance on how to access, plan and use e-learning resources within appropriate e-learning systems (Bailey, 2006).

Project aims and key questions

By providing six English departments with an e-learning advocate we hope to:

1 Have a foundation on which to provide evidence-based advice on effective and sustainable staff e-learning support models to the English subject community. *By allowing different approaches to be developed and compared can we be smarter about the integration of technologies at a subject level?*
2 Raise overall understanding amongst as many members of each participating department as possible, of the ways in which e-learning can broaden their pedagogical toolkit and potentially enhance the overall student experience. *What methods are most successful? What factors affect interest and uptake?*
3 Help overturn some of the entrenched beliefs held by academics within the community towards pedagogical innovation by enabling them to make educationally sound choices about using technology in their courses. *Can discipline-based approaches to e-learning support overcome academic scepticism?*
4 Encourage contribution to research and publication in the area of e-learning from within the discipline. *Are we merely replicating existing practice online or can the teaching and learning of the subject be enhanced?*

Project approach

English departments (including literature, language and creative writing) across the UK were invited to submit proposals indicating how they would embed e-learning in their departments over the academic year (2006-7) given the support of a nominated *e-learning advocate* for one day a week. Their role would be to act as both a catalyst for change within a department and a source of practical help and advice for those wishing to make greater use of e-learning. Interested departments were encouraged to submit innovative ideas which reached across the department and might involve design, development, refiguring or creation of e-learning materials, one-to-one consultancy, training, workshops etc. Applicants would also have to demonstrate how the support model proposed would integrate with existing institution-based strategies, initiatives or support structures. The proposal would also have to show that there was a serious commitment to the project at a senior level.

In all we received 13 proposals of which six were chosen by subject centre staff and an independent external e-learning support professional who has also been appointed as an evaluator for the project. The selection criteria included; strategy, experience, impact, sustainability, need and spread of contexts.

A network of six of these departmentally-based *e-learning advocates* has now been established. They comprise a mix of both senior and junior academics from a range of HE institutional contexts. The network is being managed by the learning technology officer at the English Subject Centre who is responsible for the professional development of the advocates, monitoring of individual projects in relation to submitted schedules/plans and overall management and critical evaluation of the support models studied in the project as a whole. A web-based project management tool is being used to help facilitate project discussion, deliver announcements, monitor progress against individual milestones and allow advocates to reflect on their experiences throughout the project in a blog-like format. In addition a baseline survey, focusing on the six unique contexts, has been carried out.

Overview of advocacy models

Department of English & Creative Writing – University of Lancaster
The English department at Lancaster have a successful track record in the teaching of Creative Writing. Their advocacy model will use the established Creative Writing methodologies as a starting point for the development of e-learning in the teaching of literature. The tools used within the virtual learning environment (VLE) designed to engage Creative Writing students and tutors in a process of *creation-response-creation* will be adapted to the teaching of literature by promoting the more fluid articulation of critical arguments/counter-arguments and to promote a sense of the critical text as process.

Department of English – Bishop Grosseteste College
The English department at Bishop Grosseteste runs both an undergraduate programme and provides input to the Primary and Secondary teachers' programmes. The department is well-resourced technologically (Whiteboards, tablet PC's etc) and so the advocacy model will provide information, support and advice to all staff in how to effectively use the technologies to make stimulating learning experiences. The key to this approach is the development of subject specific resources as examples of best practice for dissemination within and beyond the college.

English – University of Northampton
This advocacy model will explore levers for change that might facilitate the uptake of technologies within a department. The advocate will be facilitating the move from basic use of e-learning to more integrated, interactive and innovative pedagogical approaches across all modules. These developments will occur during a major 'curriculum revision' exercise. This will be achieved using such means as a VLE site where e-learning work-in-progress can be shared by staff, use of on-line logs and portfolios for assessment and the incorporation of regular student feedback into the development process.

English – University of Hull
The advocacy model at Hull centres on the use of the Interactive Whiteboard – a technology which brings together many associated e-learning tools – as a catalyst for the development of e-learning skills more generally in the department. The project also aims to build a collection of 'Whiteboard materials' which will be made available to the wider community.

English – University of Wolverhampton
The advocate will establish a regional network for e-learning in English studies between three universities. They will liaise with departments on e-learning developments within the region; discuss and suggest ways in which e-learning could be used within particular departmental contexts; support individual initiatives as an external friend; act as a conduit to enable colleagues to make useful contacts in the region; to disseminate relevant information and ideas (e.g. via an e-bulletin).

English – University of Central England (UCE) - Birmingham
The advocacy model at UCE will explore best practice in blended learning courses delivered through the VLE. The advocate will work with colleagues teaching the first year poetry module to create a best practice example of integrating e-learning into undergraduate teaching. This will assist in the development of VLE courses across the department. The project involves developing the skills of staff in using discussion fora, planning online activities that jigsaw with classroom work and with students' independent learning. There will also be monthly themed workshops involving all teaching colleagues in the department.

Conclusion

It is hoped that the variety of support mechanisms which evolve during the course of the project using this departmental 'advocacy' framework will bring e-learning support home and provide valuable new insights into best practice for encouraging the adoption of new teaching methods or materials in the teaching of English. By having six discipline-based advocates working simultaneously in a variety of institutional contexts with their departmental colleagues we also hope to gain insights into models of support which will be applicable across the academy.

References

Bailey, P. (n.d.). *Distributed e-Learning Programme*. JISC: Joint Information Systems Committee. http://www.jisc.ac.uk/programme_edistributed.html [viewed 1 October, 2006].

Hanrahan, M. (2002). *English and IT*, English Subject Centre Report No. 5. http://www.english.heacademy.ac.uk/archive/publications/reports/cit_report.pdf [viewed 1 October 2006].

Hannan, A. & Silver, H. (2000). *Innovating in Higher Education: teaching, learning and institutional cultures*. Society for Research into Higher Education and the Open University Press, Buckingham, 2000.

Holtham, C. (2005). Teaching and Learning Champions: An Institutional Perspective from the UK. Society for Teaching and Learning in Higher Education Canada Annual Conference, University of Prince Edward Island. http://www.mta.ca/3m/Clive.pdf [viewed 1 October 2006].

Lucas, B. (2006). *E-learning and sharing digital resources in English: A Scoping Study* – English Subject Centre report series (Forthcoming).

Oliver, M., & Dempster, J. A. (2003). Embedding e-learning practices. In R. Blackwell, & P. Blackmore (Eds.), *Towards strategic staff development in higher education* (pp.142–153). SRHE and Open University Press.

Stiles, M. & Yorke, J. (2003). Designing and Implementing Learning Technology Projects – A Planned Approach. A workshop paper given for the *EFFECTS – Embedding Learning Technologies Seminar*, 8th April 2003, University College London. http://www.jiscinfonet.ac.uk/Resources/external-resources/eltfinal.doc [viewed 23 July 2006].

Wiles, K. & Littlejohn. A. (2003). Supporting Sustainable E-learning: A UK National Forum, *Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education*. Adelaide, 7–10 December 2003.

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iPod, uPod? An emerging mobile learning tool in nursing education and students' satisfaction

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An increasing number of healthcare educators are using mobile learning applications, such as educational podcasts, in order to facilitate and enhance students' learning. Ubiquitous mobile technologies are becoming more important in healthcare training because of the scarcity of educators and the increase in the number of first- and second-degree students enrolling in schools of nursing. Academic podcasts provide students opportunities to access face-to-face or distance audio presentations and instructor feedback in a convenient manner. However, further adaptation of this popular technology requires empirical research in order to determine the impact of the mobile media revolution on instructional design and learning effectiveness. Nursing students enrolled in a medical-surgical didactic course report high satisfaction with this up-and-coming mobile multimedia educational opportunity.

Keywords: learning, experiential, educational technologies, M-learning, nursing, education, pedagogy, theories

Introduction

The United States Bureau of Labor Statistics forecasts a critical shortage of one million nurses or more by 2012 (NCEMNA, 2006). However, the good news is the increased interest in the healthcare profession and student enrolments in schools of nursing across the nation are increasing exponentially (Rosseter, 2002). But, the irony is the dearth of qualified nurse educators to impart the necessary nursing knowledge for the increased number of students enrolling in colleges of nursing (AACN, 2003). Therefore, nurse educators are at a pivotal position to seriously look at various learning technologies and instructional designs that will foster students' learning to become competent clinicians while considering the lack of nurse educators. This idea is supported by Burger (2006) who informs us that the healthcare division accounts for 20% of the total US market for mobile learning (M-learning). Mobile learning will become more a norm than an exception in the near future. According to the Wikipedia (2006), "M-learning is the term given to the delivery of training by means of mobile devices, such as Mobile phones, PDAs and digital audio players." Compact personal learning devices, such as Apple Computer's infamous iPod, and the ubiquitous cell phone, that store large amounts of data may be carried in a student's pocket and perhaps in the future wireless technology will allow for educational material to be delivered from students' shoes (Engadget, 2006) while they meander across college campuses. The purpose of this paper is to present an emerging M-learning tool, podcasting, used in a traditional didactic medical-surgical nursing course and students' satisfaction with the technology.

Background

The emergence of Third-generation learning technologies allow students to informally learn while being away from their computers and classrooms when it is convenient for them. Therefore changing the traditional landscape of learning and challenging educators to keep up with innovative technologies, effective learning designs, domains of learning, and today's learners. Today's generation of students have been coined *Millennial* learners or the *Net Generation*, because they have been raised in a media-rich environment and live in an information-centric world. Many of these students have surfed the Internet since early adolescence, purchase clothing and concert tickets on the Internet, and communicate with peers via multiple Instant Messaging windows (Windham, 2005). They are expert multi-taskers. Since they have been exposed to high amounts of technology during their lives they expect educators to appreciate their enthralment with technology and therefore provide innovative technological tools that parallel and echo their inherent technology skills and characteristics. Today's students demand the use of technology in the classroom in order to complete their learning and if educators do not provide it, they unfortunately are left behind in the archaic dust. Innovative technology is changing students' and healthcare providers' expectations of learning and work environments. Effective learning models, domains of learning, and knowledge of students' characteristics is important in order to provide experiential and reflective learning experiences in higher education. Furthermore, healthcare educators would benefit from conducting research that will provide educational outcomes as a result of the implementation of technological applications and instructional design.

Podcasting: How does it work?

The term *podcasting* is a derivative of *broadcasting* and the trendy Apple Computer *iPod* (MP3 audio player) and it is a relatively new method of delivering educational material via a student's desktop computer or ubiquitous MP3 player. The word *podcast* was dubbed the word-of-the-year in 2005 by the New Oxford American Dictionary, because of its rise from an esoteric activity to one of great popularity (BBC News, 2005). This example of a dynamic Web 2.0 application is extremely simple to use and is supported by Real Simple Syndication (RSS)/Extensible Markup Language (XML) technology. A simple podcast is a digital audio event (MP3 file), such as a conversation, lecture, museum guide, song, or interview that is delivered to a newsreader, such as iPodder, and a content management software, such as iTunes, that is accessed via a subscription request by the user. A pictorial diagram of how a podcast is published and subscribed is provided in Figure 1. A user may create the MP3 file two ways. One way is to use the inherent recording capability of a computer or a open-source recording software like Audacity (2006). Another way is to use a MP3 player, such as Apple's iPod photo, a good microphone, such as iTalk that attaches to the MP3 player, and if a hands-free approach is desired, a lapel microphone like Griffin's may be attached to the iTalk. Now, how does one publish and subscribe to a podcast? The digital audio file is posted to a Web site, such as the free application Blogger (2006), in a RSS 2.0 feed. Downloading a RSS reader, such as the open-source program iPodder (2006) allows users to subscribe to a specific Web page (e.g. Blogger) that contains the RSS 2.0 tagged digital files. Once the subscription is set up, the audio files will be automatically downloaded or *pushed* to an audio management system like Apple iTunes or MusicMatch. Thereafter, the user may synchronize a MP3 player with a computer (Maag, 2006a; Meng, 2006). Whereas, an *enhanced* podcast (Maag, 2006b) is composed of multimedia, such as PowerPoint slides saved as JPEG files, audio files, short video clips, images, photographs, and chapters that help organize the media production on a mobile device. Educators interested in creating enhanced podcasts may use software packages, such as Podcast Maker (2006) or Apple iLife06.

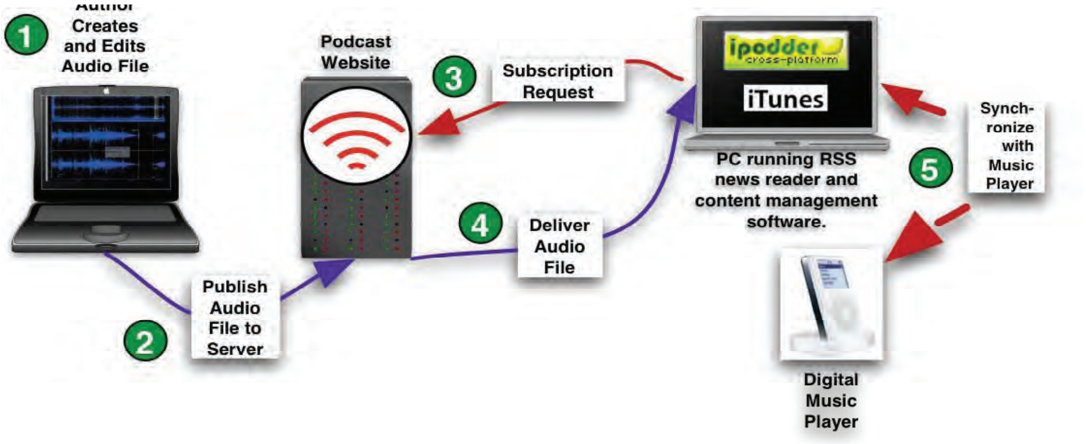

Figure 1: A model depicting the publication and subscription of a podcast
Note. Permission to reprint image obtained (Meng, 2005)

Pedagogical value

Innovative teachers and students alike have discovered an array of educational uses for podcasting (Lomas & Reeves, 2005). Lecture podcasts provide students opportunities to access traditional or distance education audio presentations or even instructor feedback in a convenient manner. Educators question the use of a lecture podcast, however, students continue to report great value in having the lecture recorded and pushed to their computers and subsequently their MP3 audio devices. And, if one conducts a simple Apple iTunes podcast search for nursing education, one will unearth many healthcare related topics, such as Instant Anatomy, Nursing Spectrum Audio CE, Anesthesiology Grand Rounds, and eNeonatal Review for easy listening. Since simple podcasts consist of a MP3 audio file, learners that benefit most from audio presentations will be attracted to such an educational offering. Linguistic professors have used podcasts for the delivery of course materials in order to help students learn and review complex foreign language words. Furthermore, foreign language students may record reflective diaries while visiting a country and have the instructor evaluate their pronunciation of foreign words and phrases via e-mail communication. In addition, the instructor may record native speakers via the interview process and then provide the native speakers' voices for the students to hear while maintaining their busy schedules. Travelling to a foreign country and accessing a simple review of commonly used foreign words and phrases via a MP3 player while sitting on an airplane, train, or bus is an example of learner-centred education. Enhanced podcasts will attract the student who is more of a visual-based learner.

Within the realm of healthcare education, medical-related images that assist students with determining patients' conditions may be viewed via the OsiriX (2006) open-source system that is compatible with the iPod. OsiriX provides healthcare professionals the opportunity to view Digital Imaging and Communications in Medicine (DICOM) files in different dimensions, and may showcase anatomical images captured by magnetic resonance imaging (MRI), computer tomography (CT), and Positron Emission Tomography (PET) devices. The OsiriX program may be used during patient grand rounds in nursing or medical education. This creative use of a system on a mobile learning device is an example of providing a method to reach different styles of learning at the point-of-care. Dental schools are also tuning into digital media in order to give students meaningful learning opportunities. Currently, more mobile learning apparatuses are being supported by streaming capable servers, such as *Xserve,* that allow for learning to continue "anywhere, anyplace, anytime" (Apple Education, 2006). Nurses may provide their patients video iPods that have relaxing video and audio productions (e.g. nature scenes) that in turn will create a relaxed environment when the patient is anxious, or create a learning environment where the patient may review a medical procedure they need to learn in order to be discharged from the medical facility. Healthcare educators may create short and simple nursing skill related enhanced podcasts and load them on MP3 players that students may check out of the college's learning department, much like a library book, before practicing the skill on a patient in a clinical setting.

It is a misconception that a MP3 player is necessary to listen to a podcast, actually the audio file may be accessed from a computer's desktop, therefore reducing costs to the user. And, according to Oakley (2006) short podcasts may be telephoned via a cell phone while using Audioblogger (2006) and then shared among students taking an online course. Other examples of podcasts used in academia include interviews of educators and their sharing of their personal knowledge and advice (Educators' Voices: An ePod Experiment, 2006). Podcasts and *vodcasts* (video-on-demand casts) may be created in order to share information about professional conferences (NI2006 Congress Podcast, 2006; hi-blogs.info, 2006). Moreover, educators may share their academic podcasts with other faculty members, students, and life-long learners worldwide by submitting their work to an online education podcast repository, such as *Ed-Cast* (2006). *Ed-Cast* is an international podcast clearinghouse, fashioned after the Massachusetts Institute of Technology OpenCourseWare (MIT OCW) initiative, that is an Internet-based service that provides free, searchable, access to peer-reviewed academic podcasts for people around the globe.

Theoretical underpinnings

As with any novel technological tool, or perhaps critics would challenge by saying *toy*, the educator needs to evaluate the reasoning behind the utilization and bridge instructional design with the learners' needs. The theoretical tenets that initially have been identified as being supportive of these learner-in-control and collaborative tools are Paivio's (1986) Mental Representations, Mayer's (2001) Multimedia Learning Theory, Siemen's (2005a) Connectivism Theory and the Learning Development Cycle (Siemens, 2005b), as well as Gardner's (1999) work on multiple intelligences (MI). With the advent of enhanced podcasts, the educator is designing a tool that taps the learner's auditory and visual channels for dual cognitive coding. Paivio highlights the importance of dual coding for effective learning to take place. Following on Paivio's heels is Mayer's theory of multimedia learning and the three assumptions underpinning Mayer's theory are dual channels, limited capacity, and active processing. The dual channel assumption is based upon the idea that animation or on-screen text is processed in the visual/pictorial channel, whereas the spoken word or a non-verbal sound is processed by the auditory/verbal channel. The limited capacity assumption is that people do not have unlimited capacity to process information in the auditory/verbal or visual/pictorial channels of working memory. Therefore, educators would assist students by not overloading them with information and give the learner shorter clips of material. Hence, when creating audio files this idea should be considered. Mayer's third assumption of active processing involves the idea that students are active participants in their individual learning and this fact is important in order to make meaningful experiences. The learner makes an effort to make sense of multimedia presentations by paying attention, organizing information, and combining new information with previous knowledge from their long-term memories (Maag, 2002). Siemens (2005b) tells us that *connectivism* as a learning theory illuminates the idea that "nurturing and maintaining connections is needed to facilitate continual learning and the ability to know where takes the place of know what and know how" (p.20). His ideas reach into the fact that technology is a critical aspect of our current social repertoire. Furthermore, Siemens (2005b) provides us with a novel meta-learning design model, the Learning Development Cycle (LDC), and this model consists of five stages: scope and object of learning design, creation of learning resources, user experience, meta-evaluation to determine effectiveness, and formative and summative evaluation of the project/learner experience. The Learning Development Cycle Considerations are provided in Figure 2. The scope of this M-learning project included a needs analysis (e.g. knowledge management and feasibility) and mobile learning is shown in the model under the heading of *create* and the user experience (e.g. learner feedback) is provided in this paper.

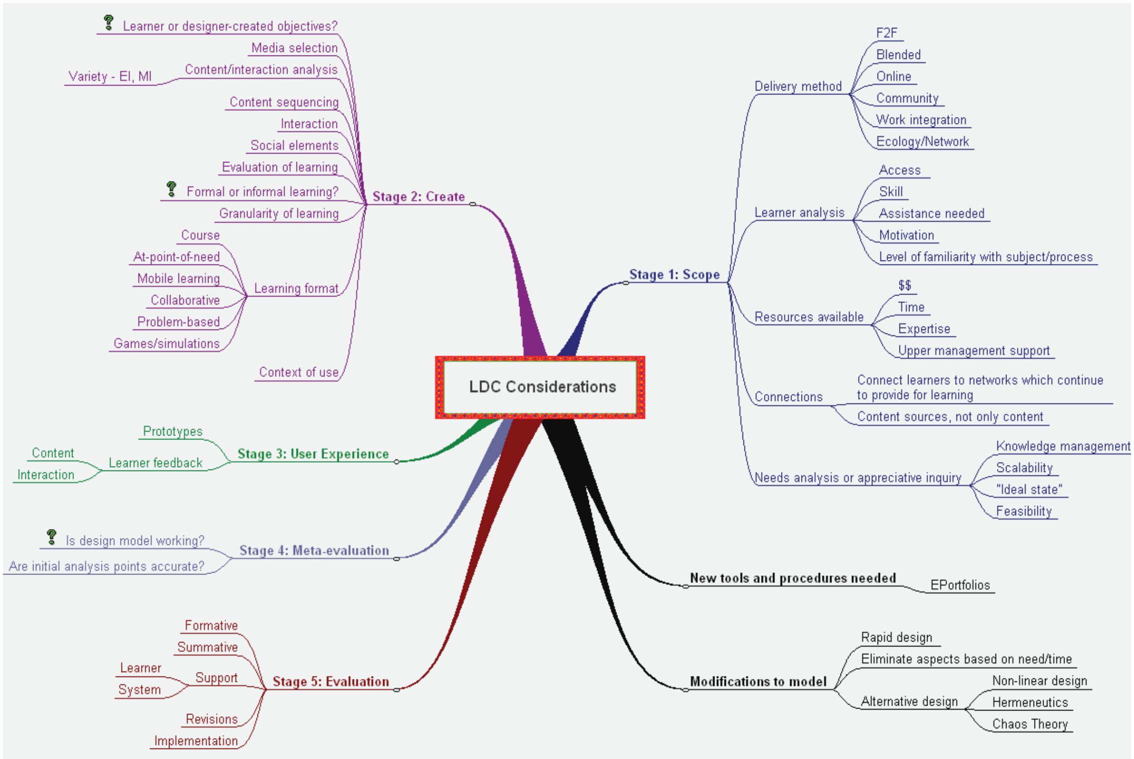

Figure 2: A model showing the Learning Development Cycle considerations
Note. Permission to reprint image obtained (Siemens, 2005)

Gardner's (1999) initial work on "seven intelligences" may support the use of technology as a tool because it involves the bodily-kinesthetics, as well as the tenet of "linguistic intelligence." According to Gardner, "My intelligence does not stop at my skin" (Goleman, 1999). Therefore, one can see how the use of podcasting is supported by the tenet of listening and learning, as well as interacting with the computer to learn and collaborate with peers. And, perhaps the use of podcasts, that allows the learner to listen to a variety of subject matters, such as the MoMAudio (2006), will be viewed as a practice that attends to MI theory.

Procedure

The author of this paper teaches a Principles and Methods of medical-surgical nursing skills course at a West Coast University in the United States. Following the attendance of an *Educause* webinar during the spring of 2005 on the new use of MP3 technology in institutions of higher education, the author purchased the necessary technology equipment and started to record, save, and upload traditional face-to-face didactic nursing lectures to a personal website (Maag, 2006c) during a 15-week academic semester. The age of the students range from approximately 19 to 30 years, the majority of the students are female (90%), and for the most part the students are comfortable using computer technology. During the subsequent two academic semesters, the lecture podcasts were offered via a server and a RSS 2.0 feed for Apple iTunes. The students accessed the traditional lectures following class. Instructor-student connection, social elements, and at-point-of-need were LDC considerations taken into account while creating the instructional design. Also, during each of the three academic semesters the instructor provided constructive feedback via a five-minute MP3 audio file to student groups regarding their group presentations presented in the classroom setting. The small audio files were emailed to the student groups via the BlackBoard e-learning platform. The students were provided survey questions regarding the use of the academic podcasts via an electronic survey program (SurveyMonkey, 2006) during week 14 of the spring 2005 and fall 2005 semesters. However, during the spring 2006 semester the students were requested to provide feedback during weeks 7 and 14. The survey results were analysed at the end of each semester and some other questions were added each semester in order to learn more about the students' satisfaction with the technology being piloted.

Results

Undergraduate and graduate students (n=34) responded to questions highlighting the availability and use of educational podcasts on an end-of-semester (spring 2005) electronic course evaluation tool. When asked, "How valuable did you find the podcast lectures posted on the instructor's website?" 32.4% of student participants stated "very valuable," 14.7% replied "somewhat valuable," and 52.9% responded "not accessing" the podcast lectures. Student participants responded to the question, "How valuable was it to receive a timely audio file regarding group project feedback from the instructor?" and 35.3% responded "very valuable," 35.3% replied "valuable," 2.9% stated "not at all valuable," and 5.9% reported not receiving the audio file. Overall, student satisfaction was very favourable and qualitative comments at the end of the course encouraged the instructor to use podcast technology during the subsequent semesters.

During the fall 2005 semester, undergraduate students (n=33) responded to the provided survey questions and 79% reported accessing the lecture podcasts, 82% of the students stated they encountered no technical problems while accessing the podcasts, 20% of the students reported accessing the lecture podcasts on both their computer desktops and MP3 player, 69% of the students requested enhanced podcasts (text and audio), and 51% requested video to be added to the lecture podcasts.

The results garnered during the spring 2006 semester were collected at midterm (week 7) and 86% of the undergraduate and graduate students (n=43) reported accessing the lecture podcasts, 80% of the students reported owning a MP3 player, 79% reported they thought listening to podcasts assisted their learning, 55% reported the podcasts provided very valuable learning experiences and 29% of the participants reported the podcasts provided valuable learning experiences, and 81% of the participants requested enhanced podcasts in the future. Students' reported they learn better if they hear the learning material more than once, and the lecture podcasts assisted them in retaining information. One student remarked how the availability of the lecture podcasts gave her the opportunity to "listen and learn" while exercising on the treadmill at the gym, therefore allowing her to return to her exercise routine, and another student stated "it was nice knowing they were available, if I needed them." Some of the other students' statements included: "They are helpful while reviewing lecture notes before an exam;" "It helps me a lot because I can't always write as fast as you talk;" "It is helpful to be able to listen to it again to refresh ideas in your mind. This way little details that you might have missed the first time through are recognized and stay in your memory longer;" "I think they are really helpful, it's something we can actually take out of the classroom to enhance our learning. If we have questions about something or we need clarification we can just re-listen to our entire lecture and make sure we understand;" "Well, for the first exam, I listened to it before I started studying with your notes. Then I would listen to it in my car.

Then I would listen to it a third time along with my notes. After all that, I would have already known the materials really well by then. I love it;" "I learn better if I hear it more than once." There are some overarching themes from these qualitative data, such as "listening and learning," "convenience," "review," "repetition," and the provision for "increased time-on-learning." These results point to how Gardner's theory of MI may support the use of lecture podcasts as a method to enhance learning.

Extra survey questions (see Figures 3-7) were added at the end of the semester due to a networking opportunity with another instructor teaching at a University in the Pacific Northwest. The other instructor is trying the new technology in her classroom too and is collecting data from her students, as well. The professor granted permission to use her student satisfaction questions and the participants in this pilot study gave their responses (n=26). The students' responses are provided in Figures 3-7.

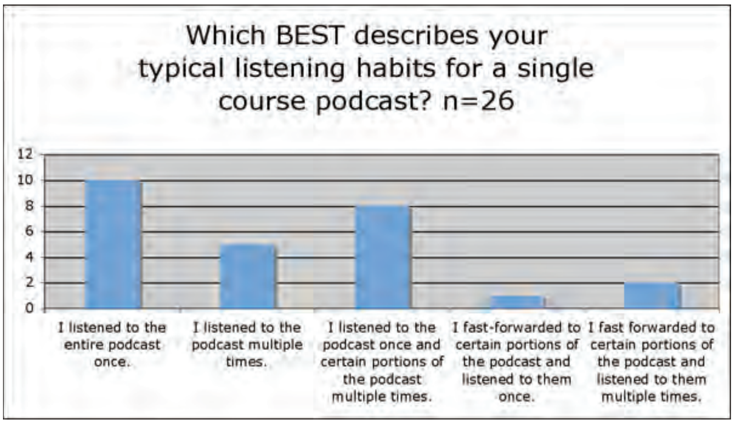

Figure 3: Nursing students' responses (spring 2006)

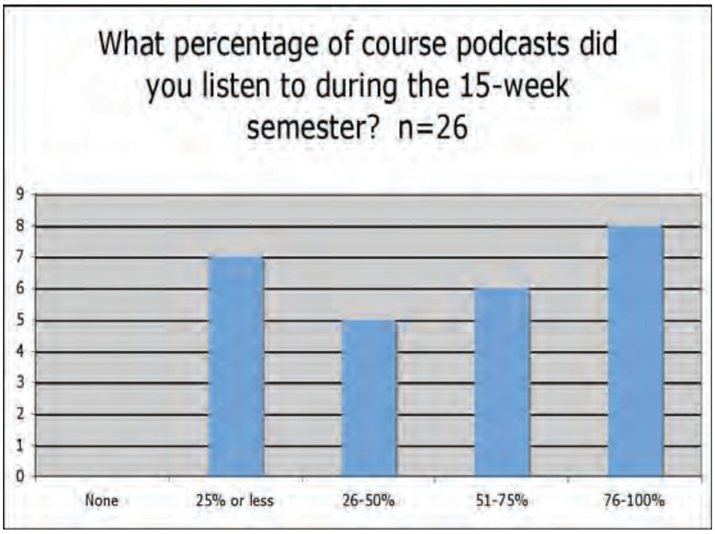

Figure 4: Nursing students' responses (spring 2006)

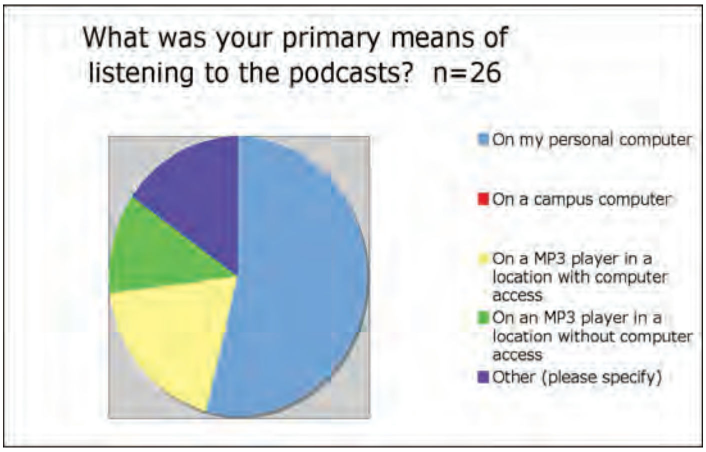

Figure 5: Nursing students' responses (spring 2006)

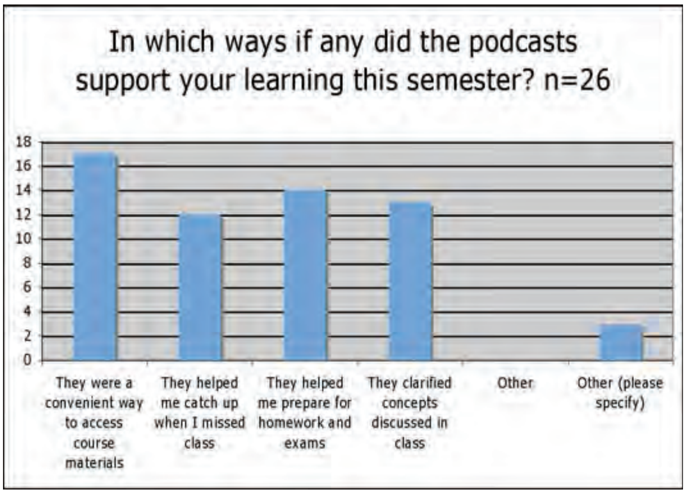

Figure 6: Nursing students' responses (spring 2006)

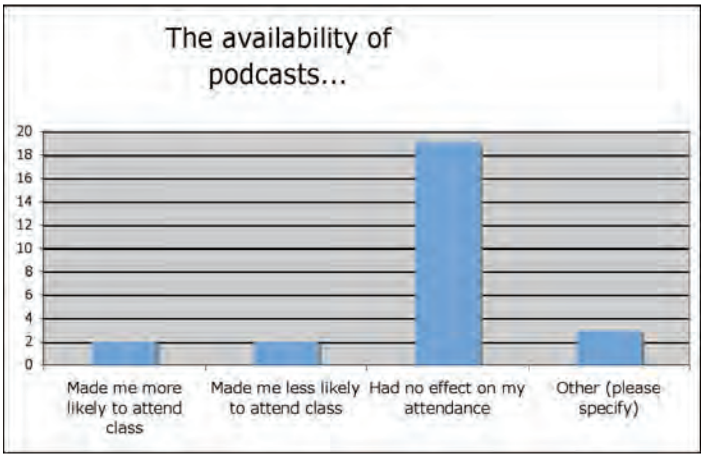

Figure 7: Nursing students' responses (spring 20006)

Discussion

Today's Net Generation is accustomed to multimedia and their everyday life is a concoction of digital, audio, video, and text information. The results of this pilot study support this fact, because the majority of the students reported owning a MP3 player and requested enhanced podcasts during the course of the academic semesters. At the conclusion of the spring 2006 semester, 50% of the students reported listening to 51 to 100% of the lecture podcasts, therefore indicating half the students were motivated to listen on a consistent basis. During the spring 2006 semester, it does not appear the students extensively listened to the lecture podcasts, however 30% of the students reported listening to the lecture podcast once and then going back to certain parts of the lecture several times. These results indicate students' needs to review specific concepts not captured in the traditional classroom setting. Over the course of the three semesters students increased their listening of the lecture podcasts on their MP3 players. However, interestingly approximately 55% reported the primary means of listening to the podcasts was via their computer desktops. It will be interesting to watch if this trend changes significantly during the next academic semester as the popularity of the MP3 players increase. The majority of the students reported the podcasts provided an opportune way to access course materials. More than half of the students reported the podcasts assisted them in preparing for exams and homework assignments. And, much to a critic's chagrin, the majority of the students reported the availability of the podcasts had no significant effect on class attendance. This was evidenced over the course of the semester by attendance lists, but perhaps educators would benefit from examining the outcomes of informal learning that is supported by mobile learning modalities. Therefore, dispelling the common educator's worry that the provision of online audio presentations will decrease students' attendance in the traditional lecture hall. Today, learning has moved beyond formal courses that provide fixed knowledge (Siemens, 2005b). Furthermore, it was apparent the students wanted to contribute more during class time when the lectures were podcasted. Conceivably their desire for interaction in the classroom was stimulated by the lecture being recorded and uploaded to the Internet, because they wanted their voices to be heard. In addition, the instructor found a desire to interact more with the students during the lecture podcast and this was evidenced when she would move into the sea of students in order to have their questions and answers casted on the Web.

Conclusion

Open-source broadcast technologies support the busy lifestyles of today's learners, allow for the reinforcement of learning material for all learners, and illuminate Chickering's and Gamson's (2006) research on excellent higher education practices. Furthermore, podcast lectures and digitized audio comments provide an opportunity for students and educators to interact or connect online in a timely manner (Siemens, 2005a). M-learning is supported by Siemens (2005b) Connectivism and Learning Development Cycle and other aforementioned theoretical tenets/learning designs. The domains of learning, especially *acquisition*, where the learner chooses to learn, and *emergence*, that includes tacit learning and promotes creativity and innovation, need to be recognized when considering the design of courses for today's avid technology-driven learners. Researchers (Mindlin, 2005) forecast between 30 and 57 million people living in the United States will access and use podcasting technology by the year 2010. Perhaps podcasting, a method to deliver user-generated content, is a tool that learners and educators may use to interact during this era of rapid technological change. An ongoing evaluation of lecture and enhanced podcasts will provide data regarding the technology and will guide plans for the development of a distance education nursing program and future research projects.

References

AACN (2003). *Faculty Shortages in Baccalaureate and Graduate Nursing Programs: Scope of the Problem and Strategies for Expanding the Supply.* http://www.aacn.nche.edu/Publications/WhitePapers/FacultyShortages.htm [viewed 19 July 2006].

Apple Education (2006). *Medical and Dental.* http://www.apple.com/education/hed/adc/professionalstudies/medical.html [viewed 18 July 2006].

ascilite (2006). Style sheet for authors preparing papers for ascilite conference proceedings, http://www.ascilite.org.au/conferences/sydney06/papers.html [viewed 22 July 2006].

Audacity (2006). http://audacity.sourceforge.net/ [viewed 18 July 2006].

Audioblogger (2006). http://audioblogger.com/ [viewed 22 July 2006].

BBC News (2005). *Wordsmiths hail podcast success.* http://news.bbc.co.uk/2/hi/technology/4504256.stm [viewed 20 July 2006].

Blogger (2006). http://www.blogger.com [viewed 18 July 2006].

Burger, J. (2006). *The US Healthcare Market for Mobile Learning Products and Services: 2006-2011 Forecast and Analysis.* http://ambientinsight.com/Reports/MobileLearning.aspx [viewed 20 July 2006].
Chickering, A. W., & Gamson, Z. F. (2006). *Seven Principles for Good Practice in Undergraduate Education.* Available at http://honolulu.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/7princip.htm [viewed 22 July 2006].
Educator's Voices: An ePod Experiment (2006). http://www.blogger.com/posts.g?blogID=16001993 [viewed 18 July 2006].
Engadget (2006). *Unboxing the Nike+iPod Sport Kit. http://www.engadget.com/2006/07/13/unboxing-the-nike-ipod-sport-kit/* [viewed 22 July 2006].
Ed-Cast (2006). http://ed-cast.org [viewed 19 July 2006].
Gardner, H. (2006). http://www.infed.org/thinkers/gardner.htm [viewed 15 October 2006].
Goleman, G. (1998). *Working with emotional intelligence.* Bantam Books: New York.
hi-blogs.info (2006). http://www.hi-blogs.info [viewed 21 July 2006].
iPodder (2006). http://juicereceiver.sourceforge.net/ [viewed 19 July 2006].
Lomas, C., & Reeves, J. (2005). *Podcasting possibilities*. http://www.educause.edu/LIVE055 [viewed 22 July 2006].
Maag, M. (2002). The effectiveness of an interactive multimedia learning explanation on baccalaureate nursing students' mathematical achievement and self-efficacy (Doctoral dissertation, University of San Francisco, 2002).
Maag, M. (2006a). Podcasting and MP3 players: Emerging education technologies. Computers, Informatics, Nursing, 24(1), 9-13.
Maag, M. (2006b). cit_workshop_041806. http://web.mac.com/margaretmaag/iWeb/Site/Podcast/Podcast.html [viewed 20 July 2006].
Maag, M. (2006c). *Maagnursing: Podcasts.* http://www.maagnursing.com/podcast/ [viewed 22 July 2006].
Mayer, R. (2001). *Multimedia learning.* Cambridge: University Press.
Meng, P. (2006). *Podcasting & Vodcasting: A White Paper.* http://edmarketing.apple.com/adcinstitute/wp-content/Missouri_Podcasting_White_Paper.pdf [viewed 21 July 2006].
Mindlin, A. (2005, August 15). Podcasts: All the rage or about to fizzle? *The New York Times*, p. C6.
NCEMNA (2006). *Nursing Shortages Predicted.* http://www.ncemna.org/singlenews.asp?item_ID=532 [viewed 18 July 2006].
NI2006 Congress Podcast (2006). http://ni2006.blogspot.com/ [viewed 22 July 2006].
Oakley, B. (2006). PAC 442 Section B at UIS [online course homepage on the Internet]. http://pac442b.blogspot.com/ [viewed 20 July, 2006].
OsiriX (2006). *Screenshots.* http://homepage.mac.com/rossetantoine/osirix/Index2.html [viewed 20 July 2006].
Paivio, A. (1986). *Mental representations: A dual coding approach*. Oxford, England: Oxford University Press.
PodcastMaker (2006). http://www.apple.com/downloads/macosx/ipod_itunes/podcastmaker.html [viewed 19 July 2006].
Rosseter, R. (2002). *Though Enrollments Rise at U.S. Nursing Colleges and Universities, Increase Is Insufficient to Meet the Demand for New Nurses.* http://www.aacn.nche.edu/Media/NewsReleases/enrl02.htm [viewed 20 July 2006].
Siemens G. (2005a). *Connectivism: A Learning Theory for the Digital Age* http://www.elearnspace.org/Articles/connectivism.htm [viewed 22 July 2006].
Siemens, G. (2005b). *Learning Development Cycle: Bridging Learning Design and Modern Knowledge Needs.* http://www.elearnspace.org/Articles/ldc.htm [viewed 19 July 2006].
SurveyMonkey (2006). http://www.surveymonkey.com [viewed 22 July 2006].
Wikipedia (2006). *M-learning.* http://en.wikipedia.org/wiki/Mobile_learning [viewed 19 July 2006].
Windham, C. (2005). The student's perspective. In D. G. Oblinger & J. L. Oblinger (Eds.), *Educating the net generation* (pp. 5.1-5.15). Washington DC: Educause.

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Who is learning? A preliminary study of an online elearning dissemination strategy

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Use of an online good practices site at the University of Sydney, the Health Sciences eLearning Resource Centre, was examined using WebCT visitor data. Results indicated continuing expansion of site awareness and demonstrated patterns of activity across the calendar year. Analysis of 2006 users made visible a substantial proportion categorised as providing online teaching support.

Keywords: elearning, diffusion of innovation, staff development, learning designs

Introduction

Dissemination of good practices in the elearning arena is a continuing call. Southwell et al (2005) reported a repository approach as useful but not sufficient, while McKenzie et al (2005) suggested a low use of web-based collections. This paper reports from a continuing study of a dissemination strategy of a staff support resource launched at the University of Sydney in response to staff requests for examples.

The central focus of the strategy is the Health Sciences eLearning Resource Centre (ERC). This is an online gallery of selected examples of learning designs using elearning approaches, with commentary by the designers and early adopters of strategies and materials. Learning designs are '... a deliberate set of learner activities and roles within a specific context whose completion is likely to bring about the development of particular forms of knowledge, skills and understanding' (Oliver & McLoughlin, 2003, p.96). The gallery presents examples in six categories: learning through professional practice, learning through using a scenario or case study, learning through interaction, learning through critical use of the literature, learning foundational knowledge, and learning to teach and learn online. An online resource, rather than a series of events, was the selected strategy to overcome the barriers of limited time and geographic location in a very large, multi-campus university. Most examples are by University of Sydney colleagues. In some technically more demanding cases specific instructions for constructing a similar site are provided. The site was launched to the target audience, academic staff with university teaching responsibilities, in December 2004; while designed for the health sciences faculties it is available to all academic staff and all existing WebCT users; other general staff must request access to the site. Active promotion of the site has primarily been within the University's five health sciences faculties using a range of strategies (Mahony & Wozniak, 2006a).

Roger's (2003) diffusion of innovation approach is used as the theoretical framework for the study. The core of Rogers' widely known work on the dissemination of innovation is encapsulated as: 'Diffusion is the process by which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system' (Rogers, 2003, p.11). In this paper the innovation is the ERC and the focus is on elements of the social system and time. Rogers (2003) describes a social system as 'a set of interrelated units that are engaged in joint problem solving to accomplish a common goal' (p.23). The research questions are:

- Who are the users of the ERC?
  - Who has visited at least once? (an indicator of awareness)
  - Who has made at least one substantial return visit? (a proxy indicator for at least considering use)
  - Who are multiple return users? (a proxy indicator for possible application of learning from the ERC)

- When do they use the ERC?

Method

WebCT provides site visit data. University staff were expected to use their unique university identifier (their ‘UniKey’) to access this resource. Penetration of UniKey use in late 2004, however, was unsatisfactory, and a guest login was also made widely available until March 2005 to facilitate access. Any return user who had initially used this guest login was therefore identified as a new user on their identifiable first visit. Each unique site user was coded (Table 1) using personal knowledge, the University’s telephone directory and/or other advice. Only identified unique users are included in this study.

Table 1: Categorisation of site users

Category	Explanation
Faculty subject matter experts	Academic appointees with content specialisation, normally with some direct teaching responsibilities (17 faculties). These were the target group for the ERC.
Non faculty specialist unit personnel	e.g. University Library, Koori Centre, Institute for Teaching & Learning, NH&MRC Clinical Trials Centre
Online learning support staff	Comprising the University’s central Flexible Online Learning Team, general staff in faculties providing online learning support activities, and academic staff in faculties appointed for the purpose of providing teaching and learning support and not contributing discipline expertise or holding direct teaching responsibilities
Not allocatable	Identified users not categorisable.

Data presented in Figure 1 were drawn from user first access dates falling in 2005 or 2006 (excluding guest login users). Table 2 ‘Categories of site users 2006’ is drawn from analysis of unique users with latest visit date in 2006 (the 35 weeks from 1 January to 3 September).

Patterns of use

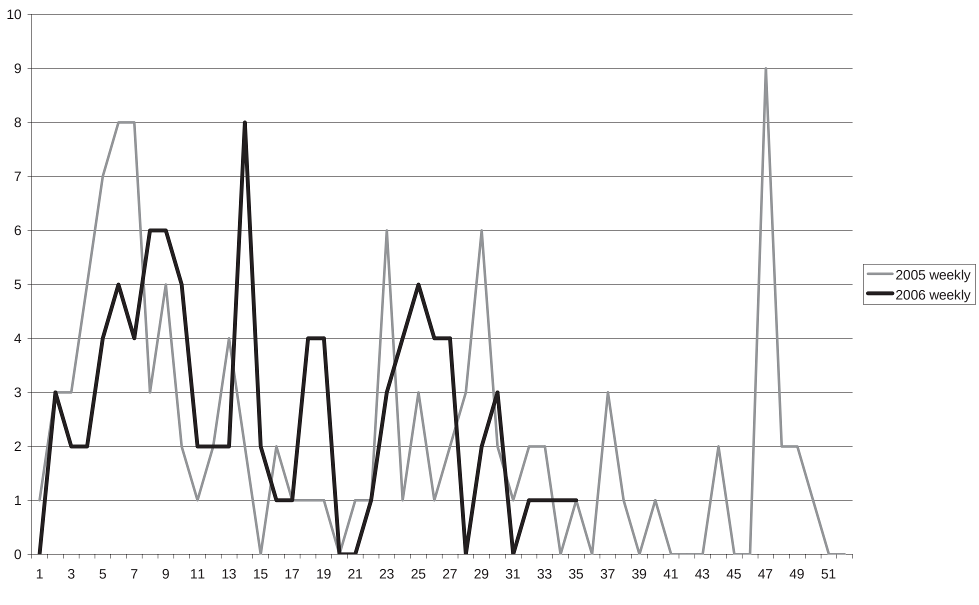

Figure 1: Pattern of first time use

Semester dates were not congruent across the university in 2005; this changed in 2006. Semester 1 is representative, however, with roughly weeks 10–23 timetabled teaching and weeks 23–27 student study vacation and examination period. Figure 1 demonstrates the continuing stream of new ERC visitors over 21 months and displays the patterns of initial visits. The early months of the calendar year (the Australian academic year is March–November) and the mid-year semester break period so far represent a more likely period for a first time visitor.

Overall, the ongoing visits by new visitors indicate continuing dissemination of ERC awareness. Purposeful return visits (at least one return more than one week after the initial) implies a bank of visitors using what the site has to offer. Multiple returns may be a proxy indicator for application and further inquiry on the nature of visit use with these staff is planned. These findings indicate the continuing apparent usefulness of the ERC and illustrate the value of examining dissemination of an innovation over time.

Table 2 presents the categories of visitors in 2006. The substantial proportion of users in the Online Teaching Support category was unexpected (both in quantity and in institutional location). Analysis of visitor identity exposed a broad range of faculty-based staff with full- or part-time commitment to this activity.

Table 2: Site visitor categories 2006

Category	Number	%
Faculty subject matter experts	56	50%
Specialist units staff	13	12%
Online teaching support	37	33%
Not allocatable	5	5%
Total	**111**	**100%**

Examination of the multiple return data emerging from the 2006 detailed usage project also indicates that many multiple returnees are in the Online Teaching Support category. These findings have exposed less visible elements of the University's elearning 'social system', providing a basis for further inquiry about the ERC's impact on practice.

Limitations to the study

While WebCT is the University's centrally provided learning management system (LMS), some faculties use an alternative LMS. This posed an ERC use barrier (e.g. staff using Blackboard would not log in to a different LMS for the purpose of looking at good practice examples, M. Freeman, personal communication 2006).

As in all LMSs, WebCT visit data only indicate that a site has been clicked on; the nature of site use must be explored using other means and will be the focus of further study later in the year. (As the ERC is password-protected, however, even initial site visits must be somewhat purposeful.) Limitations in the design of the resource also prevents tracking visits to individual ERC sections.

Initial availability and visitor data collection (December 2004 to at least April 2005) were affected by the guest log-in and by glitches in access provision. The latter highlighted an unfortunate institutional barrier when access to such a professional development resource cannot be automated through direct links to the human resource management systems. This has been an ongoing difficulty.

The ERC is a living resource, with additions made regularly as other elearning strategic projects are completed and/or good practice examples identified. Users more aware of this aspect may visit regularly merely to check whether something new has been added.

Finally, promotion of the ERC has been uneven. The only systematic campaign known to be conducted has been in the Faculty of Health Sciences, and this has been impacted by changes to faculty-wide communication strategies during the period of the study (e.g. introduction of limitations to use of all staff emails).

Conclusions

WebCT site visit data enabled usage patterns of a learning design gallery to be revealed. Site utility over time is confirmed by the visit patterns reported. Made visible in this exploratory study is the substantial use by 'online learning support staff' of a resource provided as a response to expressed needs of academic staff. Patterns emerging from the visitor data may better inform in-person professional development and support activities. Further research is necessary to explore the factors triggering initial visits, the reasons for returning or not, and the use made of what is learned by visitors to such a galley.

References

Mahony, M. J. & Wozniak, H. (2006a). Roger's diffusion of innovation theory and professional development in eLearning: a case study of the 'CHS eLearning Resource and Staff Support Project'. In M. Tulloch, S. Relf & P. Uys (Eds.), *Breaking down boundaries: International experience in open, distance and flexible education – Selected papers* (pp. 70–78). Charles Sturt University, Bathurst: Open and Distance Learning Association of Australia.

Mahony, M.J. & Wozniak, H. (2006b). Show me an example! *Synergy*, No 23. http://www.itl.usyd.edu.au/synergy/article.cfm?articleID=273 [viewed 15 October 2006].

McKenzie, J., Alexander, S., Harper, C., & Anderson, S. (2005). *Dissemination, adoption and adaptation of project innovations in higher education*: Report for the Carrick Institute for Learning and Teaching in Higher Education.

Oliver, R., & McLoughlin, C. (2003). Pedagogical designs for scalable and sustainable online learning. In A. Littlejohn (Ed.), *Reusing online resources: a sustainable approach to eLearning* (pp. 94–105). London: Kogan Page.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.), NY: Free Press.

Southwell, D., Gannaway, D., Orrell, J., Chalmers, D., Abraham, C. (2005). *Strategies for effective dissemination of project outcomes.*

Bionotes

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Educational design and online support for an innovative project-based course in engineering design

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A new course in Engineering Design and Innovation used a project-based learning approach to facilitate learning the design process, the development of design thinking and the skills required to solve open-ended design problems. The course involved over 950 first year students, in the Faculty of Engineering at the University of New South Wales. Students were enrolled in nine schools of engineering in the faculty. A WebCT Vista course was used to support student learning in design teams and to integrate and manage the course. Online facilitation methods were used to support student learning during several phases of the design process. Online peer assessment and review processes were used to encourage reflective learning and be time-efficient for academic staff. The paper includes survey data from the first offering of the course.

Keywords: design, engineering design, project-based learning, online facilitation, student peer assessment, student peer review

Introduction

The Faculty of Engineering at the University of New South Wales introduced a new course in Engineering Design and Innovation for first-year engineering students. This involved running a faculty wide course for over 950 students enrolled in 9 different schools of engineering. The aim was to take a project-based approach, with students working in teams to do a design project. The course was administered centrally through the Faculty with each School offering one or more projects aligned to various disciplines. This placed a heavy focus on the need for a coherent pedagogical framework upon which learning outcomes and assessments could be uniformly measured. A common conceptual focus on the engineering design process was critical so that students would learn the same process for resolving open-ended problems regardless of the specific design project they were working on. To create a unified course, the students were all brought together for the first two weeks and given an impromptu design task modelled on an activity previously introduced by one school (Reidsema, Wilson, & Netherton, 2004). Additionally they all used the same engineering design textbook (except for a small number doing an environmental project). An online course in WebCT Vista was set up to provide a common access point, support and communication framework for all students and staff. The online course played a key role in coordinating and supporting key learning activities for project groups with large numbers of students.

The School of Mechanical Manufacturing Engineering had over 240 students doing its design project. The school had previously pioneered a design course taking the project based approach with similar numbers of students. The previous course was a major influence on the faculty-wide course design and development. Due to the large number of students, the online support from a WebCT course was seen to be critical. The staff member involved (CR) wished to introduce a greater emphasis on written reflection to reinforce learning for several stages of the design process as well as addressing perceived shortcomings in written communication and critical analysis skills. As this would involve the assessment and prompt feedback of written work for a large number of students, a student peer review and assessment process, enabled by online technology, was required. The Calibrated Peer Review system (Chapman, 2001) was implemented to address these issues. Due to a significant proportion of the student's final mark being attributed to group performance, the iPeer system (iPeer, 2006) was also used to support student peer review and assessment of individual students' contribution to the final group mark. These became major parts of the online design and development for this research project.

This paper focuses on the educational design of the course and the online technologies to support learning and teaching. Most specific processes and evaluation data are based on the students doing the project offered by the School of Mechanical and Manufacturing Engineering, as this school had the largest number of students, identified the requirements for, and made the greatest use of online technologies to support and enable learning activities associated with the design project and reflection. The project aims, issues in educational literature, a description of the course and evaluation data from an end of course survey are all included. The paper ends with a discussion of key issues and suggestions for further development.

Project aims

Key aims for the project and online support include:

- Design and implementation of a project-based learning approach to a new Engineering Design and Innovation course. Project-based learning includes group work, individual reflection, student peer review and assessment.
- Design and development of an online course in WebCT Vista that will assist staff to manage the course and support key learning processes associated with:
  - the phases of the engineering design process,
  - group work on design projects,
  - individual reflection on learning design, group process and project management capabilities,
  - student peer review and assessment.

Learning outcomes for students in the new course included:

- Familiarity with the process of engineering design and the use of design methods for defining an open-ended design problem, generating alternative and innovative conceptual solutions and evaluating these solutions.
- Understanding the dynamics of collaborative teams and how to work effectively within a team to accomplish tasks within given deadlines.
- Understanding the basic elements of managing a design project and being able to plan and schedule work activities in accordance with standard practice.

These aims and outcomes defined the project as they clarify the focus of learning and the learning process required of the student and the requirements for the online course design. A range of findings from educational literature were influential in shaping the detailed educational design and online support provided to enable the project aims and learning outcomes to be attained. These are discussed in the next section.

Literature review

There is a strong rationale for introducing engineering design courses into the curriculum. Design is considered to be a distinguishing feature of the engineering profession, and both the US and Australian professional bodies have identified the need for courses that develop the flexible thinking, teamwork, and communication skills associated with working in teams on open-ended problem-solving tasks such as a design project (Dym, Agogino, Eris, Frey, & Leifer, 2005; Felder & Brent, 2003; IEAust, 1999). These skills are often seen as 'soft' skills by staff in engineering schools, as engineering courses tend to place a critical emphasis on analytical skills associated with scientific reasoning, logical and convergent thinking, all of which are important to engineers (Shah, 2005). There is a growing recognition, however, that design thinking is complex problem-solving that is important to the profession and practice of engineering (Dym et al., 2005) and that the communication and teamwork skills associated with design projects are capabilities that lead to graduate attributes that are important for an effective professional.

Design thinking involves generating ideas and evaluating their potential, using lateral thinking as well as scientific reasoning, visual thinking and generating novel solutions as well as analytical processes. It means bringing creativity into a process that still requires engineering analysis and precision to realise the project – a combination of divergent and convergent thinking that is specific to the discipline (Shah, 2005). The thinking processes required for engineering design are different, and possibly more complex than those required for analytical courses.

Project-based learning is the method of choice for many design courses as design tasks fit well with this approach (Dym et al., 2005). Criticisms of design courses as being soft and fun as opposed to serious engineering may be made in ignorance of the rich possibilities for developing student capabilities that are inherent in the project-based approach when it is effectively applied. These include the capabilities that lead to graduate attributes, and processes, such as group projects, that may help to socialise students into the university environment and develop the flexible thinking needed for more advanced design courses as well as the so-called 'hard' engineering courses to come. Project-based learning has strong similarities with the problem-based learning (PBL) approach that has been widely used to foster high-level learning outcomes in many professional courses. The problem-based approach is an experiential learning approach to enable students to develop capabilities required to solve complex 'real-world' problems during a professional education program (Savin-Baden, 2000). The approach involves students working in small teams to consider the implications of a problem and how they will resolve it. They need to generate hypotheses, identify the deficiencies in their own knowledge that must be overcome to resolve the problem scenario, decide how they will investigate the knowledge required to learn the necessary skills and techniques. Finally they need to apply new and existing knowledge and capabilities to a resolution of the problem. Problems should be ill-structured and open-ended (Hmelo-Silver, 2004). One identified difference between the two approaches is that project-based science uses a variety of computer-based tools to scaffold students' problem-solving, while PBL uses simpler tools (Hmelo-Silver, 2004).

Research into effective learning using the problem-based approach has shown a key role for facilitation to ensure that students focus on the key learning issues, discuss them and follow them up in later stages, and that lessons are learned and reflection on new learning occurs at each stage of the problem-based learning process. An important role for the facilitator is to ensure that students understand the implications of the problem and identify what they need to learn, and to reflect on what they have learned. Giving the students a visual focus for learning by creating a structured whiteboard to direct the students' focus on the key learning issues and record them is one of the simple PBL tools that have been effective in the facilitation process (Hmelo-Silver, 2004). A critique of design education in Engineering is that the required facilitation and support is too labour-intensive and that design courses are too expensive to be sustainable (Dym et al., 2005). Research and development on PBL has identified ways of embedding parts of the facilitation process in online technologies so that the time demand on academic staff can be reduced. Facilitation can be aided by guides that students can use themselves to facilitate group learning process during specific stages of the PBL process, online 'whiteboards' that can be monitored by a facilitator who is not present when the students are meeting or working on the project independently and communicating online (Steinkhuehler, Derry, Hmelo-Silver, & Delmarcelle, 2002). These processes have a potential application to project-based learning in Engineering to aid the sustainability of design courses.

Reflection and peer review

Online supports have been developed in many Engineering Design courses to aid reflection using peer review and assessment processes (Campbell & Colbeck, 1998). These are used to encourage students to fully engage with the design process and group work, and to reflect on these processes to reinforce learning. Student peer assessment has been used to assess individual student assignments, enabling students to see and review the work of other students and to reflect on their own (Hanrahan & Isaacs, 2001). It has also been used to review and assess contributions to group projects by the team members (McGourty, 2000). Some advantages of student peer review of group processes are that the process of completing feedback improves awareness of group processes and the need for effective contribution, and that staff receive valuable data on contribution from those best placed to perceive it – the other students. These data can be used for assessment (McGourty, 2000). Miller (2003) found that introducing a wider range of rating scales and criteria improved the qualitative discrimination that could be obtained from peer review, which consequently improved the overall value of the process. The use of 'behavioural anchors' – additional guidelines for students to use to aid interpretation of criteria was found to improve rating reliability (Ohland, Layton, Loughry, & Yuhasz, 2005).

Staff time can be a critical issue when student peer review is applied, as the process can be difficult to manage if the anonymity of raters is to be preserved while still carefully tracking the process. Hanrahan and Isaacs (2001) found student peer review with large numbers of students (200+) to be feasible but very time consuming for academic staff. From their study of peer review of individual assignments they recommended providing exemplars of good work to aid the assessment process. A solution to the time demands of peer review can be to use online systems to manage the process. These have been developed for both forms of student peer review. The Calibrated Peer Review system provides an automated process that presents the exemplars that Hanrahan and Isaacs (2001) suggested as being an important support, and effectively trains the student to carry out peer reviews of individual work from other students through a calibration process. It then asks the students to review and assess three other assignments and then review their own (Chapman, 2001). Esechenbach and Mesmer (1998) describe an online system for managing peer review and assessment of contributions to group projects.

The outcomes of research in these areas were used to inform the learning design for the course and the online materials to support it. Key considerations were student-focused support for project-based learning and group facilitation, and peer review and assessment processes. The online support for the course needed to support or enable these learning processes to foster high levels of engagement with the group design project, and reflection and peer review to reinforce deep learning. The next section describes the course design.

Course design

Students attended lectures and practical laboratory sessions. They had some structured group meeting times with staff mentors but were also expected to (and did) meet with their project groups more frequently to complete the project. Online group discussions were also set up to allow groups to interact flexibly. Project-based learning included an impromptu design activity (start to finish in two hours), and a major design project that took the remaining ten weeks of semester to complete. Lecture time was cut back and additional time in the laboratory was allowed when students were building and testing their prototypes. All final prototypes were performance-tested against the criteria in the design brief on one day. Design projects included making a mechanical hand, a solar powered device that would climb a vertical pole and come back down again, and an air powered vehicle using the battery, motor, and fan from a handheld battery-powered vacuum cleaner. Assessment was based on the group report, testing the project, individual reflections on phases of the design process, and an individual report on the impromptu design experience.

The online course, in WebCT Vista, played an important role in supporting the course and maintaining cohesion and a single faculty-wide course identity with a wide range of design projects being offered by different schools. The online course was structured with introductory material, information on all projects, and an online question and answer discussion for students answered by the course coordinator. This was needed to aid orientation for the 950 students. Organisers within the online course were set up for each school project. After the first two weeks that included the impromptu design activity, students divided into subgroups around school projects. Students then worked in small groups on the design project. The detailed design of the online course described below was to meet the needs of the largest school group, with 240 plus students. Other school groups used some of the online resources, but each school operated independently, and made different use of the online course.

The most critical need for online support for learning processes was to facilitate students to learn the design process individually and to apply it to the project design in groups. The design process was divided into the following phases:

- Phase 1. Formulating the problem to identify the range of aspects of the task that may be investigated further. This leads to a statement of the design problem.
- Phase 2. Conceptual design – generate a range of design concepts for solving the problem.
- Phase 3. Evaluation – critique and evaluate the proposed concepts to select the best solution.
- Phase 4. Detailed design – refine the solution and consider implementation issues.
- Phase 5. Implementation – building and testing the design prototype.

These phases are similar to the stages of the PBL process (Hmelo-Silver, 2004). Each phase is critical to learning the overall process of design. As large numbers of students had to be facilitated through the project based learning process by one academic staff member, and a small group of mentors who were inexperienced in facilitating design projects, the online support materials included instructions for individual work on each of the first three design phases, and activities to be done as a group following individual preparation for the phase. Students were then asked to reflect on what they did in the phase, what they experienced, and what they learned. This was done individually as a portfolio reflection, and submitted for assessment. The same process was repeated for phases two and three.

Facilitation processes adapted from those described in Steinkhuehler et al. (2002) and Hmelo-Silver (2004) were applied in this course. With few academic staff, the emphasis was on self-facilitation. To aid the process a 'Group Facilitation Guide' was created for each of the first three phases. This was designed so that a student could use it to facilitate the group activity for that phase. The guide has directions for facilitation, types of questions to ask to clarify issues during group discussions, and a model 'whiteboard', so that ideas from the group can be displayed and further learning activities identified and defined. The combination of individual work, student-facilitated group work with some support from a mentor, and individual reflection encourages students to focus on each design phase and to identify their own learning. The online support enabled a large part of the facilitation role to be taken by the online technologies while still ensuring that focused learning and reflection occurred. As there was no compulsion for students to use these guides the developers were interested in the extent to which they would be used, and how effective they would be.

Hmelo-Silver (2004) stresses the importance of reflection on learning at the end of each stage of the PBL process to reinforce the key points and identify further learning. To further enhance the value of the students' reflective portfolios the Calibrated Peer Review (CPR) system was implemented (Chapman, 2001). CPR is an online system that effectively trains a student to review and assess other student's work using good, medium, and poor exemplars, with questions and feedback. The students then assess three other papers using the same criteria and reassess their own. This process is consistent with the solution proposed by Hanrahan and Isaacs (2001) above. It is manageable for large numbers of students as manageability is not contingent on numbers. Using CPR students had the opportunity to see a good example of the portfolio reflection and to reflect again on their own. They also receive three sets of feedback on their own assignment from other students. Once the exemplars were written, using the system took little time to manage by academic staff.

Reflection on contribution to group process is also a valuable learning opportunity. Using marks from the peer review system to moderate the marks for the overall group assessment marks provides additional incentive for students to contribute effectively to the group project. As one of the most common complaints from students about group work is the non-contribution from some other students this incentive is important (Gibbs, 1995). Additionally, first year students are generally ill-equipped in dealing with non-contributors early enough for intervention by staff to be effective. The iPeer (2006) system was used to provide peer feedback and assessment on individual contribution to the work of the group. Criteria given in the text book for the course (Voland, 2004, p. 21) were set up in iPeer for student feedback. As this contained a wide range of criteria (ten), the benefits of greater discrimination described by Miller (2003) could be realised. Use of this online system placed minimal demands on academic staff time while providing data for assessment, and gave the students a valuable additional opportunity for reflective learning.

The overall course design provided the students with flexible access to a range of resources and used online systems to support and enable key learning activities. Resources included notes from important lectures. Online support, other than the systems referred to above, included:

- An online discussion for all students involved in a school project. This was unmoderated but staff monitored the discussion and contributed when this was warranted.
- Online discussions for members of project teams. Students were free to decide whether they would use these. Some groups used them extensively and others very little.
- Guidelines on working in teams on group projects.
- Guidelines on study skills.

The overall design was entirely focused on the learning activities associated with the design project and the associated systems, described above, to enable and support the process.

Evaluation

Students in the School of Mechanical and Manufacturing Engineering project group were asked to complete an online survey for evaluating feedback on the project at the end of first semester 2006. 124 out of 240 students completed the survey – a response rate of 52%. The survey covered a range of issues relating to the educational design of the course and the online support systems used to enable learning activities. These include:

- student learning from the design project
- applications of online support
- group work related to the major project
- reflective tasks and peer review.

Survey data on each of these is included below.

Student learning from the design project

Questions on the cognitive aspects of project-based learning are shown in Figure 1. These were included to see if the students saw the level of challenge as appropriate, that they saw themselves as building new knowledge on existing structures, and that they felt they developed a problem-solving capability – a major goal of the project based approach.

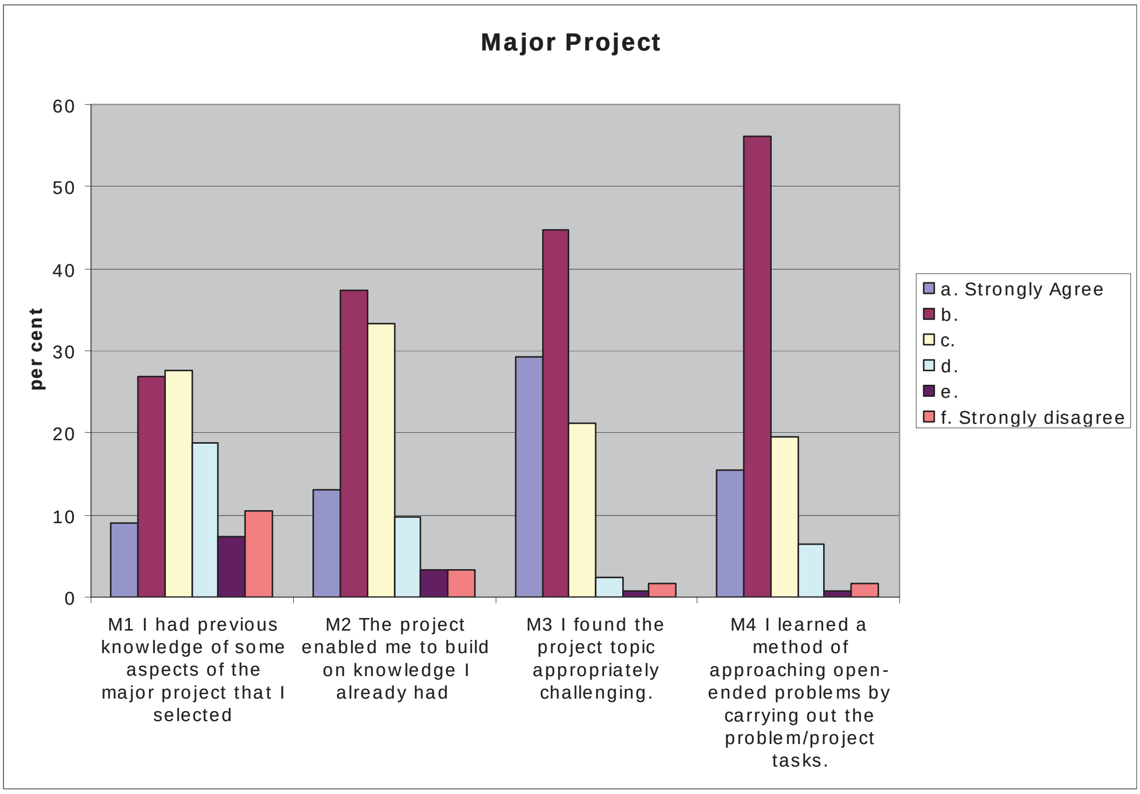

Figure 1: Cognitive aspects of project-based learning

The results show mixed response to question M1 on having prior knowledge. This is understandable due to the unusual nature of the project task – to design an air-powered vehicle. Students however clearly felt that they built on prior knowledge (M2). The level of challenge was also seen as appropriate, suggesting that students did not see the course as a soft option. Students clearly felt that the method of solving open-ended problems was attained.

Application of online support

Students were assessed on the notebook activities and the reflective portfolio. There was no direct instruction or assessment on the tasks that group members were expected to carry out in team meetings. This led to some concern about whether students would use and follow guides to these processes. Questions S2–S5 in Figure 2 indicate that the students saw the purpose of and made use of the scaffolding provided by these guides. The use of the group facilitation guide (S3) shows the highest level of 'strongly agree' responses in the survey. This is encouraging as use of this guide was an optional extra rather than a requirement.

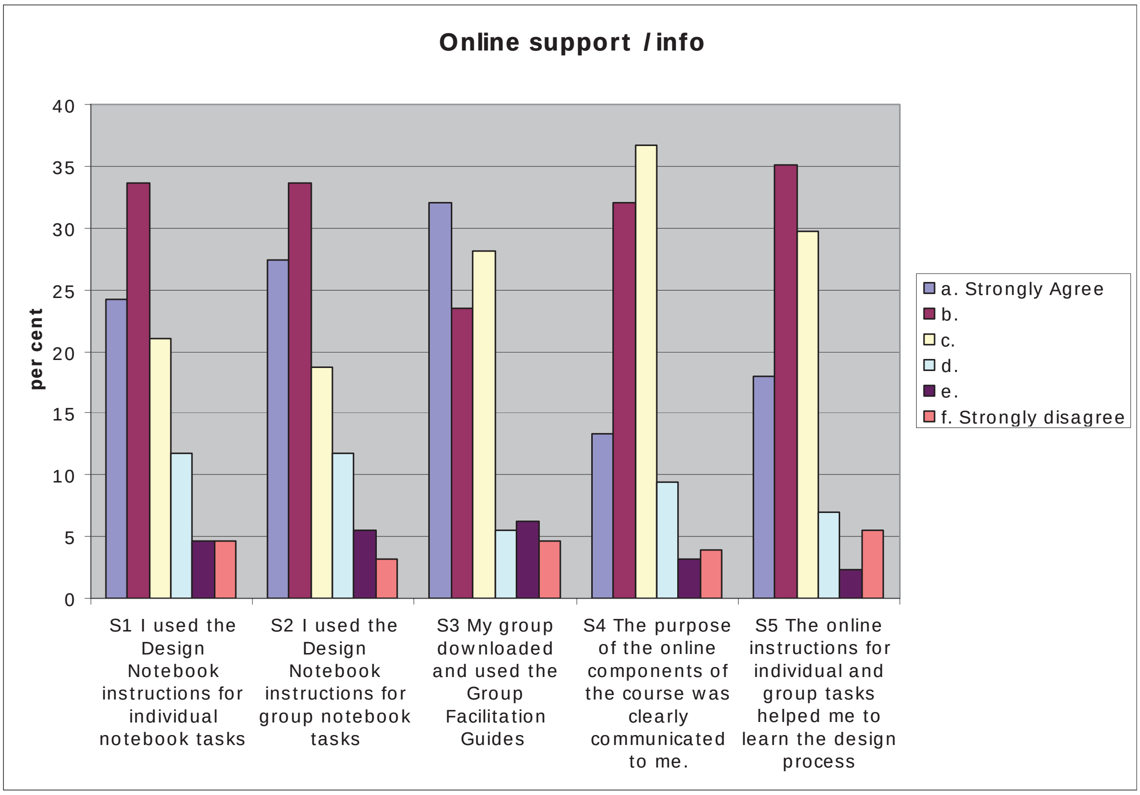

Figure 2: Application of online support

Group work related to the major project

Questions T1–T4 on working in groups (Figure 3) show strong agreement on key aspects of group work, and the value of group work in the course. The data show strong agreement on working closely with other students, and learning from other students, during the group process. Both of these are critical to the intended learning processes for the course, as they contribute to the development of the students' understanding of the design process as well as the development of communication and teamwork skills. T4 shows that students generally found working in a group to be a valuable learning experience. This is also critical as students will be engaged in group work again, on design courses later in their degree programs. It also suggests that the facilitation process for group work have been generally successful.

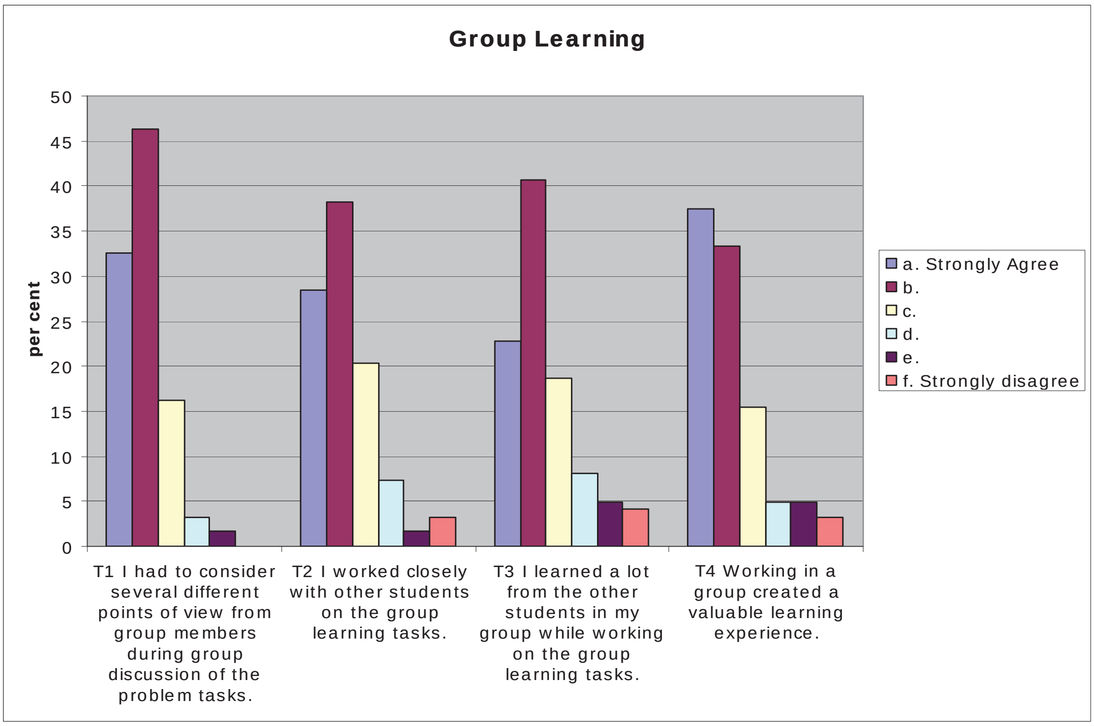

Figure 3: Group work related to the major project

Reflective tasks and peer review

Questions L1–L5 in Figure 4 focus on written reflection and peer review. Communication skills and the ability to communicate in writing were identified as an important outcome for the course – a contribution to the development of graduate attributes. The reflective portfolio tasks had this aim in addition to a reflection on learning at the end of each phase. These questions also focus on the effectiveness of the CPR process. Feedback is more equivocal in this area than in the aspects above. While the majority of students agreed, significant levels of disagreement to L1 shows that many students were not convinced of the value of the reflective portfolios for learning the design process. Responses to L2 show a similar level of disagreement on the value of peer assessment. There was strong agreement with L4, showing that the students do not expect to be developing written communication, which may explain some of the disagreement in L1 and L2. Responses to L5 show a high-level agreement, showing that students did feel they improved their written communication skills as a result.

The responses to L7 and L8 are important. L7 shows that students generally feel they developed a deep understanding of the design process, and L8 shows a perception that the skills learned will be of value to them in other engineering courses. This also suggests that students do not see the course as a soft option. Disagreement with these statements is the lowest of all the questions in this group. It is still, however, nearly 10%, indicating a range of students who have not seen the full value of the process. More communication on the importance and value of the learning processes in the course may reduce this percentage further in future offerings of the course.

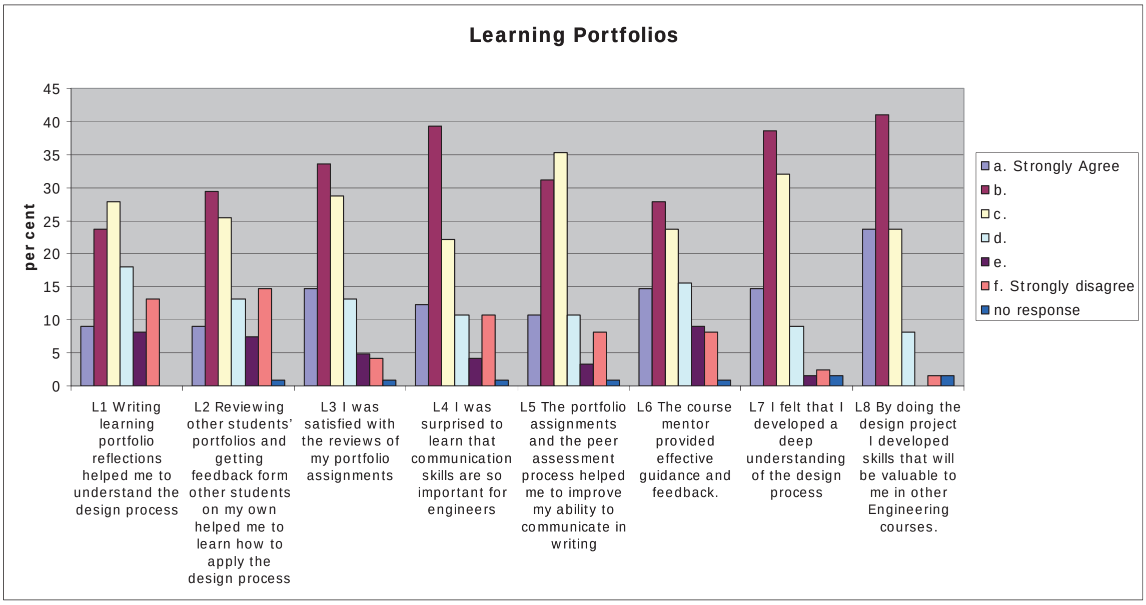

Figure 4: Reflective tasks and peer review

Conclusions

The course appears to have successfully met most of its aims – a good result for the first time offering of a major innovation. The key learning activities associated with phases of the design process led to completion of design projects as intended. Students rose to the challenge of assessment tasks such as group design reports, reflective portfolios and design notebooks, as well as the design project. The evaluation data reported above suggest student satisfaction with the process and what they learned. While the data also suggest some areas for improvement, the main aims relating to implementing a project-based learning approach that includes group work and individual reflection and peer review were achieved in a way that most students engaged with and enjoyed.

Online support played a key role in integrating the course, and facilitating project based learning for a group of 240 students in the School of Mechanical and Manufacturing Engineering project. Student feedback indicated that they made use of the online resources for facilitating the design process and group work, and that they found the group project to be a satisfying learning experience. The group facilitation guides, developed on the basis of research by Hmelo-Silver (2004) appeared to have been a valuable development for this course, and will be the subject of further study. Online student peer assessment and review using CPR and iPeer also played a role in enabling the learning processes and giving the students feedback on their own work and contribution. The students gave positive feedback on most aspects of what they learned, and the way they learned, showing a response to the course and the skills they developed that refutes the "soft option" perception of design courses in engineering reported by Dym et al. (2005). Dym et al. also report that design courses can make excessive demands on staff time. The online processes used in this course ensured that learning activities were completed for every phase of the process without placing heavy demands on staff time after the initial set up.

The range of online processes used in this course could be applied in other project or problem-based courses, as they are designed and developed to encourage self-directed learning and to make staff workloads sustainable. Individual activity and group facilitation guides for phases of the PBL or design process, combined with small-group online discussions, enable self-direction of individual learning and group processes, reducing but not eliminating the need for facilitation by academic staff. These were seen by staff and students to be a valuable support for student learning. Written reflections on learning from phases of the project were assessed by an online student peer review, which provided additional reflection and rapid feedback and assessment. Reflection on group processes and assessment of individual contributions was provided by iPeer. There are other online peer review systems available with different characteristics. Both of the systems used in this project, CPR and iPeer, are freely available for staff who wish to use them. All of these processes help to focus self-directed student learning in a PBL environment without adding time demands on academic staff after the initial setup. These processes can be used to support and enable project and problem-based learning in a range of disciplines.

More development work needs to be done on management of student expectations, so that students have a better understanding of the importance of written reflection and peer review in this course. A valuable area for further research and development is to investigate the processes that students use in more detail, so the key learning outcomes from project based learning can be further identified and strengthened in later offerings of this course.

References

Campbell, S., & Colbeck, C. L. (1998). *Teaching and assessing engineering design: A review of the research*. Paper presented at the ASEE Annual Conference & Exposition, "Engineering Education Contributing to U.S. Competitiveness", Seattle, Washington, June 28–July 1, 1998.

Chapman, O. (2001). *Calibrated Peer Review: A writing and critical thinking instructional tool.* Retrieved June, 2005, from http://cpr.molsci.ucla.edu/

Dym, C. L., Agogino, A. M., Eris, O., Frey, D. D., & Leifer, L. J. (2005). Engineering Design Thinking, Teaching, and Learning. *Journal of Engineering Education*, 94(1), 103–120.

Eschenbach, E. A., & Mesmer, M. A. (1998). *Web-based Forms for Design Team Peer Evaluations*. Paper presented at the 1998 ASEE Annual Conference & Exposition, "Engineering Education Contributing to U.S. Competitiveness", Seattle, Washington, June 28–July 1, 1998.

Felder, R. M., & Brent, R. (2003). Designing and Teaching Courses to Satisfy the ABET Engineering Criteria. *Journal of Engineering Education,* (January 2003), 7–25.

Gibbs, G. (1995). *Learning in Teams: A Tutor Guide*. Headington: Oxford Centre for Staff Development, Oxford Brookes University.

Hanrahan, S. J., & Isaacs, G. (2001). Assessing Self- and Peer-assessment: the students' views. *Higher Education Research and Development*, 20(1), 53–70.

Hmelo-Silver, C. E. (2004). Problem-Based Learning: What and How Do Students Learn? *Educational Psychology Review*, 16(3), 235–266.

IEAust. (1999). *Manual for the Accreditation of Professional Engineering Programs*. Retrieved March, 2004, from http://www.ieaust.org.au/membership/res/downloads/AccredManual.pdf

iPeer. (2006). *iPeer: a peer evaluation web application*. Retrieved July, 2006, from http://ipeer.apsc.ubc.ca/ipeer_site/

McGourty, J. (2000). Using Multisource Feedback in the Classroom: A Computer-Based Approach. *IEEE Transactions on Education*, 43(2), 120–124.

Miller, P. J. (2003). The Effect of Scoring Criteria Specificity on Peer and Self-assessment. *Assessment and Evaluation in Higher Education*, 28(4), 383–394.

Ohland, M. W., Layton, R. A., Loughry, M. L., & Yuhasz, A. G. (2005). Effects of Behavioural Anchors on Peer Evaluation Reliability. *Journal of Engineering Education*, 94(3), 319–326.

Reidsema, C., Wilson, S., & Netherton, C. (2004). *Impromptu Design as a Vehicle for Developing Team Work and Problem Solving Skills in Design Engineering*. Paper presented at the International Conference on Engineering Education, Gainesville, Florida, U.S.A

Savin-Baden, M. (2000). *Problem-based Learning in Higher Education: Untold Stories*. Buckingham: The Society for Research into Higher Education & Open University Press.

Shah, J. J. (2005). *Identification, Measurement and Development of Design Skills in Engineering Education*. Paper presented at the International Conference on Engineering Design, Melbourne, August 15–18.

Steinkhuehler, C. A., Derry, S. J., Hmelo-Silver, C. E., & Delmarcelle, M. (2002). Cracking the Resource Nut With Distributed Problem-Based Learning in Secondary Teacher Education. *Distance Education*, 23(1), 23–39.

Voland, G. (2004). *Engineering By Design* (2nd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

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What do first year students think about learning graphics packages?

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This paper discusses the assessment of the change from Auto-des-sys's FormZ to @Last's Sketch Up as the primary CAD program in first semester, first year, delivered through a new compulsory course, *Human Environments: Design and Representation*, and the introduction of a graphic design based elective course, *Imaging Our World*, in the School of Architecture, Landscape Architecture and Urban Design at The University of Adelaide. The evaluation process involved pre and post semester questionnaires, weekly feedback from students and course SELTS. The aim is to accurately determine students' interests in digital media in design and to introduce new and relevant digital media components into the undergraduate degree to provide a suitable and structured lead-in to the Masters of Digital Media program.

Keywords: digital media in design, educational evaluation

Introduction

In 2005 a study was undertaken for The School of Architecture, Landscape Architecture and Urban Design at The University of Adelaide, in order to assess and assist in the restructure of the digital media components within the Bachelor of Design Studies degree, in accordance with the requirements and opportunities graduating students face when entering the workforce (McCarthy, 2006). There were two primary forms of information for this study. 1) A series of industry professionals and recent graduates, from relevant design fields were interviewed to gain a broad understanding of employers' expectations regarding potential employees and the nature of projects graduates experience as they enter the workforce. 2) Questionnaires were created to determine the current Design Studies students' interests regarding digital media. The interviews emphasised the growing importance of digital media within most fields of design. Strong digital skills are especially important for architecture graduates, as they will initially be employed for drafting and presentation purposes, two areas dominated by digital media, while they are trained in the design principles of the firm. The questionnaires highlighted the growing interest in digital media within our cohort, in all areas of design. The study assisted in two outcomes within Design Studies, specifically the change in 3D modelling software, in first year, from Form Z to Sketch Up, delivered in a new core course *Human Environments: Design and Representation*, and the introduction of a graphic design based elective subject, *Imaging Our World*, also in first year. In recent years there has been much discussion regarding suitable approaches to teaching software packages to students and incorporating these digital skills into design-based courses. Pietsch, (2005), raises the concern that too much emphasis is being placed on the "keystroke approach", where students spend excessive amounts of time learning the technical aspects of a program rather than using it as a design tool. Bromberek, (2005), adds to this by questioning whether specific software packages should be included in the curriculum at all, instead leaving this choice to students:

> The huge range of other 'essential' software means that vast commitment would be required from people new to all the worthy packages to master them. Then, it is more than likely that the package, mastered at great expense of time and effort, will not necessarily be the one that the employees or clients need. There is not enough time to train in any particular software package (Bromberek, 2005).

The importance of incorporating specific software packages into the curriculum becomes evident however, after discussions with architects; as Jason Schulz, Director of DASH Architects, emphatically states, "the first thing I look for in a prospective employee is which software packages they are familiar with." The focus here should be the selection of relevant software programs to include, and their delivery within an appropriate vehicle. There was a shared opinion throughout the academic staff in the school that FormZ had become inappropriate as an introduction to 3D modelling for first year Design Studies students (Pietsch, Shannon, McCarthy, 2006). Sketch Up was examined as a possible replacement, over a six-week summer scholarship program involving the five academic staff members responsible for delivering the restructured first year course, and ten accomplished Design Studies students. The program included software training sessions, cross-platform file analysis to test the possible association between Sketch Up and other programs, evaluating existing digital tutorials and their capacity to integrate with Sketch Up, along with the design of *new* tutorial exercises, and was ultimately the catalyst behind the change. Sketch Up was delivered to students in the form of *Human Environments*, the restructured, core first year course in first semester. This course combines design and representation skills, introducing students to architecture and landscape architecture through small-scale designs; and to representing such designs through both CAD and hand drawn techniques. It was decided that *Imaging Our World* would take an urban design approach and incorporate Adobe Photoshop as a presentation tool for students.

Method

The evaluation of the two new courses involved four key steps: a pre-semester questionnaire, weekly feedback from students, course SELTS (Student evaluations of learning and teaching), and a post-semester questionnaire. The pre-semester questionnaire was issued to the students in the digital workshops in week one in *Human Environments*. The students were broken down into two categories – those who chose *Imaging Our World* as their elective course (IOW students), and those who did not (non-IOW students). The questionnaire was designed to determine a) students' initial interests in the following digital media topics: web and graphic design, architectural and landscape visualization through animation and image composition, character animation and visual effects; and b) their intended study paths. Throughout the semester students were given the opportunity to provide feedback regarding the two courses through a series of weekly digital workshops, where they were introduced to new digital skills through small, assessable design exercises. The exercises often required students to research topics and complete work outside of course contact hours, while the assessment criteria covered three key areas – technical ability, design quality and reflection. Firstly, it was important that students learnt and retained the technical skills introduced during the workshops. The tasks were presented in front of the class, of approximately 40 students, on a projector by the lead tutor. This '*instruction*' period would last for around 25 minutes and was followed by one-on-one help in a studio environment. Secondly students were required to demonstrate a strong design quality in their work. This was assessed through the students' responses to specific design problems within the exercise, such as spatial relationships in a small dwelling. Finally, reflection was assessed through a 200-word statement supplied by the student, which included feedback on the exercise and any difficulties they faced. This weekly feedback allowed an ongoing assessment of the two courses throughout the semester, making it possible to immediately address any serious concerns. The course SELTS were held during week 11. A *special survey* was used for *Human Environments*, which included additional questions regarding Sketch Up, such as the students' confidence regarding their newfound communication skills, the ease of learning Sketch Up, and their confidence in tackling new software packages as a result of learning Sketch Up. Lastly the post-semester questionnaire was distributed to students during the digital workshops in week 12. Key questions featured in the previous questionnaire were retained to determine if there were any substantial changes in a) the students' interests in specific areas of digital media, and b) the students' intended study paths. Questions concerning the students' experiences with digital media during the semester were also included.

Results

The pre-semester questionnaire, featuring a response rate of 74%, provided some substantial results. 65% of this year's first year students are school leavers, and the majority have had minimal experience with digital media in design. The students' reactions to learning specific areas of digital media were generally positive despite this lack of experience. When asked whether they would like to see the inclusion of such digital media components within the Design Studies degree the responses were as follows: there was a positive response of 75% to digital graphic design, architectural and landscape visualization through animation, and image composition, and 71% to visual effects. Only web design and character animation generated a comparatively low positive response of 55% and 52% respectively. These statistics were compiled using a Likert scale with responses ranging from 1 (strongly disagree) to 4 (undecided) to 7 (strongly agree). The questionnaire also indicated that the majority of students, 64%, entered Design Studies with the intention of going on to the architecture degree. 9% indicated they would go on to the architecture / landscape double degree, 11% to landscape architecture, 5% to Masters of Digital Media, while 11% suggested that completing Design Studies was their only intention. Generally the weekly feedback from the students was positive, particularly from two students who failed the corresponding course last year, when Form Z was in use. Both students commented on the ease in which they were able to communicate their design ideas in Sketch Up as opposed to Form Z, as one noted, "the way in which we create objects is so much easier." The most compelling results however, came from the post-semester questionnaire. Here there was one sizeable difference between the IOW students and the non-IOW students. When asked which areas of digital media they would like to see included in Design Studies, the IOW students' mean responses were substantially higher towards graphic design, architectural animation and image composition, the three topics they had experienced during the semester, indicating that students responded positively towards the digital media components within both *Human Environments* and *Imaging Our World*. Further supporting this claim were the results from the non-IOW students. Again there was a substantial rise in interest within architectural animation and image composition. There was, however, only a minimal rise in interest in graphic design (+0.1, 5.5 to 5.6), suggesting that *Imaging Our World* was responsible for increasing students' interest in digital graphic design, as shown in Figure 1.

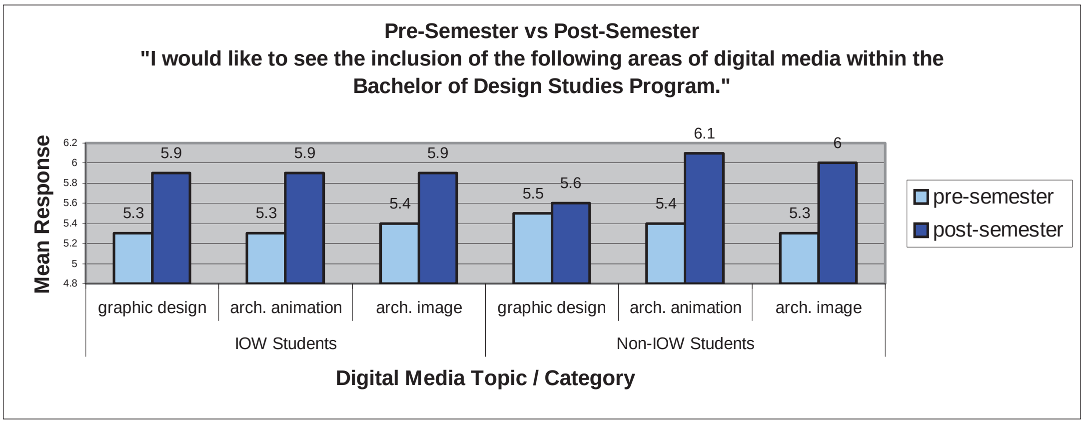

Figure 1: Pre-semester versus post-semester, non-IOW Students and IOW Students

Changes within both groups of students were also noted when it came to their intended study paths. The percentage of students intending to go onto to architecture decreased dramatically: 70% to 42% among IOW students, as shown in Figure 2. The most notable increases were Design Studies, 3% to 12%, Architecture / Landscape Architecture double degree, 10% to 24%, and the Masters of Digital Media Program, 3% to 12%. This last figure indicates there is a growing interest among Design Studies students in the Masters program, from the initial stages of the undergraduate course.

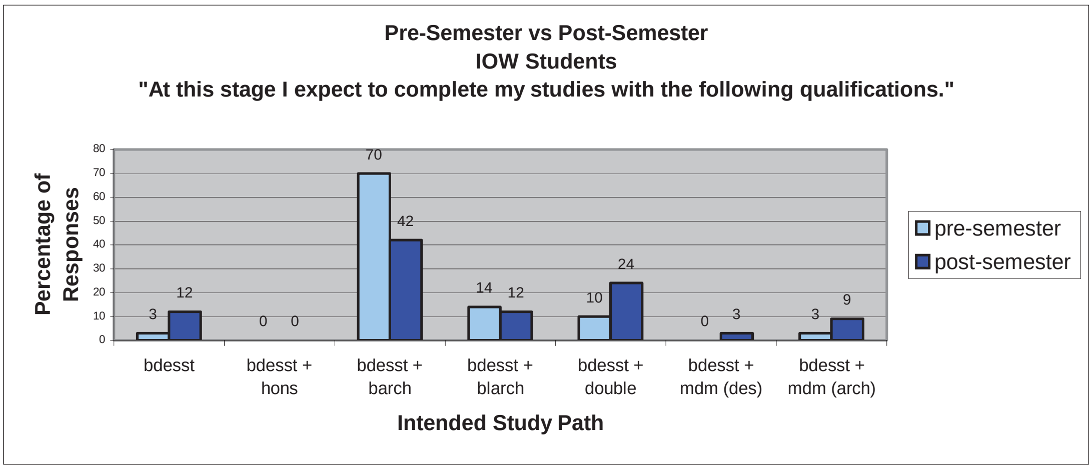

Figure 2: Post-semester versus pre-semester, IOW Students

The changes amongst non-IOW students were far less substantial. Again architecture dropped off, from 60% to 52%, the 8% distributed among the various alternatives, most notably the Architecture / Landscape Architecture double degree, from 9% to 14%, and the Masters of Digital Media program, from 6% to 10%. The general response to the digital media components within both courses was positive. When asked whether they had enjoyed the digital media components within *Human Environments*, 100% of IOW students responded positively, a mean response of 6.1, while 87% of non-IOW students responded positively to the same question, a mean response of 5.5. When asked whether they had found the digital media components in *Human Environments* relevant to their studies, 97% of IOW students responded positively, a mean response of 6.4, while the positive response rate among non-IOW students rose, also to 97%, a mean response of 6.2. Finally, when IOW students were asked the same questions regarding *Imaging Our World*, the response rates were again pleasingly high, 97% enjoying the digital media components, a mean response of 6.2, and 100% finding them relevant to their studies, a mean response of 6.6.

Conclusion

The students' growing interests in digital media, made evident by the comparative analysis of pre and post-semester questionnaires, underline the importance of digital media within the program, and suggest the restructuring of first year has been prosperous. The course SELTS results for both *Imaging Our World* and *Human Environments* support this, and confirm their successful integration into the program. All of the questions in the SELTS concerning the courses or digital media received a mean response of 5.0 or higher. The results suggest that despite a lack of experience regarding digital media in design, first year students are excited by the prospect of learning new digital skills. Furthermore the positive responses to both Sketch Up and Photoshop, supported by the increase in interest in the Masters of Digital Media program, indicate a *growing* migration towards digital media. Over semester two 2006, the study of digital media within Design Studies will continue with the analysis of second and third year students and their experiences with the two elective courses, Digital Media II and Digital Media Studio III.

References

Bromberek, Z. (2005). Computer use in architectural studies from a teacher's perspective: a UTas case study. In K. Holt-Damant, & P. Sanders (Eds.) *Drawing Together: convergent practises in architectural education*. Proceedings of the 3rd International Conference of the Association of Architecture Schools of Australasia, Brisbane, UQ & QUT for the AASA.

McCarthy, J. (2006). Digital Media within the Bachelor of Design Studies degree. To be presented at *ANZAScA Conference*, November, 2006, Adelaide.

Pietsch, S. (2005). Post what? Dilemmas in digital design education. In Holt-Damant, K., & Sanders, P., (Eds.), *Drawing Together: convergent practises in architectural education*. Proceedings of the 3rd International Conference of the Association of Architecture Schools of Australasia, Brisbane, UQ & QUT for the AASA.

Pietsch, S., Shannon, S., McCarthy, J. (2006). Changing Track – Form Z to Sketch Up – rationale, tactics and outcomes'. To be presented at *ANZAScA Conference*, November, 2006, Adelaide.

Schulz, J. Director of DASH Architects, Interview, 04-08-2005.

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Chinese higher education teachers' conceptions of e-Learning: Preliminary outcomes

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Over the past three years, the Centre for Studies in Advanced Learning Technologies, Lancaster University, and the School of Network Learning, Beijing Normal University, have been involved in the development of e-Learning courses and in carrying out research into e-Learning. During this collaboration, we became aware of cultural differences in our approaches to the design and implementation of e-Learning courses. This led us to consider the differences and similarities in our conceptions of e-Learning, and their effects on the design, development and implementation of e-Learning courses. A new comparative research project looking at UK and Chinese higher education teachers' conceptions of e-Learning was established. This paper reports on preliminary results of phenomenographic interviews with higher education teachers in China working in 'conventional, campus-based universities concerning their conceptions of e-Learning. The interviews were analysed from a grounded theory perspective that resulted in a set of preliminary conceptual categories namely the centrality of the lecture, online cooperative learning, network learning, student learning, and infrastructure and access. Discussion of these categories is presented which illuminates the state of e-Learning in Chinese higher education. We conclude that the dominance of traditional teaching methods in China is unlikely to present the conditions for mainstreaming e-Learning in the near future.

Keywords: conceptions of e-Learning, phenomenography, China higher education system, student learning

Introduction

The UK Higher Education Funding Council has funded a series of inter-related projects in what has now become known as the eChina-UK Programme. In Phase One of the programme there were two main objectives. The first was to foster collaboration between UK higher education institutions and Chinese higher education institutions in the production of Masters level courses using e-Learning for school teachers in China. This involved us collaborating with Beijing Normal University in the joint production of a Masters level module in "Educational Technology and E-Learning". The second objective of the programme was to develop understandings in both countries of cultural change and exchange in e-Learning pedagogy. Members of the various UK project teams (of which there were four) held different views on the importance of this second objective, as did the Chinese partners.

The UK team involved in the production of the "Educational Technology and e-Learning" module, however, believed that this objective was as important as the production of the Masters level modules, if not more important. Our experience of working with colleagues in China made us aware of the complexities of culture and cultural differences in the collaborative production of the Masters level module. We were presented with real challenges related to working across boundaries. The additional problem of language played a decisive role in our negotiations and understandings of what we were trying to achieve. Nevertheless, we did not lose sight of the wider objective of trying to understand culture and cultural change and exchange (see Banks, Lally, Liu, McConnell, 2006, for an examination of our experiences of the processes of intercultural collaboration).

From our work to date in Phase One of the eChina-UK Project it has become apparent to us that we have to develop a shared (that is, 'intercultural') understanding of pedagogy (teaching, learning, e-tutoring etc) if we are to be successful in collaboratively developing e-Learning materials and in generating successful professional educational development in e-Learning. Although 'intercultural' in this context primarily refers to the 'large' Chinese-British cultures, it can also refer to 'smaller' cultures that exist in both countries.

This is a complex process in which our ideas and understandings of terminologies, issues and practices have to be constantly discussed, revisited and renegotiated, and in which new understandings emerge as we proceed. In an intercultural setting such as this collaborative Sino-UK e-Learning project, we are aware that the ideas underpinning the two different cultures of China and the UK distinguish each of us from the other (Dahl, undated). For example, in working together and being exposed to these different cultures we have become more aware of our own teaching and learning culture in the UK and that of our colleagues in China. We have started to understand this process, but much remains to be done. We call this "Intercultural Professional Development", and an in-depth, critical examination of it is the focus of our combined work in Phase Two of the Programme. The results of this new project will be of direct benefit to both UK and Chinese higher education systems by making use of the synergy of ideas and resources available in joint project developments. In Phase Two, we have agreed to carry out research aimed at developing our understanding of intercultural e-Learning pedagogy as the core of the project work.

Examining intercultural understandings

The examination of intercultural understandings is being carried out in two ways:

Firstly, and most importantly, we are examining intercultural understandings of e-Learning by the joint Sino-UK development of an online course in intercultural e-Learning pedagogy, designed to allow UK and Chinese higher education staff to explore differences and similarities in their understanding of e-Learning pedagogy and to collaboratively develop new shared knowledge about teaching, learning and tutoring in e-Learning contexts. The content of this course is to include learning material designed specifically to facilitate collaborative intercultural exchanges which will illuminate different conceptions of e-Learning. We also plan to develop and evaluate new pedagogic methods and tools to support formative assessment (knowledge extraction and analysis).

Secondly, intercultural understandings are being examined by comparative research into UK and Chinese higher education teachers' conceptions of e-Learning. This is the focus of this paper. We have developed a methodology for doing this based on existing research into teachers' conceptions of teaching and learning.

There are two important elements underpinning this work:

Conceptions of e-Learning
The first important element is the area of research interest, which is concerned with examining teachers' conceptions of e-Learning and e-teaching.

Considerable research has been carried out into students' conceptions of "conventional" (that is, face-to-face) learning and into teachers' conceptions of "conventional" teaching (e.g. see Entwistle, 2005; Entwistle and Walker, 2000; Kember, 2000; Kember & Kwan, 2000; McConlogue, 2003; Pratt, 1992). This research indicates that conceptions of teaching may have a bearing on the ways in which university staff carry out their teaching.

Entwistle (2005) suggests there are relationships between teachers' conceptions of teaching (including their beliefs about teaching), their approaches to teaching (which may be, for example, teacher focused or student focused) and their level of understanding about teaching (that is, their knowledge about teaching and learning and their experiences of teaching methods). All of these influence teachers' understandings of student learning and impact on their relationship with a class. An understanding of teachers' conceptions is therefore likely to help in the process of understanding and improving teaching (Prosser, Trigwell and Taylor, 1994).

As far as we can tell, no research has been carried out into the more specific area of higher education teachers' *conceptions of e-Learning and teaching*, in China or the UK, which is the focus of this study. We think this is an important area for research. The findings of research into conceptions of "conventional" learning and teaching have been used to help university teachers and professional developers understand the ways in which students approach learning and the ways in which teachers approach teaching, and these understandings have been used to change and develop practice. We expect research *into conceptions of e-Learning and e-teaching* to lead to similar useful outcomes. In the context of this study, we are interested in how Chinese higher education teachers think about e-Learning, how they go about planning for e-Learning and how they integrate e-Learning into their practice.

Phenomenography
The second important element underpinning this research is the methodological approach adopted in carrying out the research. A phenomenographic approach was chosen in which we focused on identifying and describing the qualitatively different ways in which people understand phenomena in the world around them. Phenomenography (Marton & Booth, 1997) suggests that we are guided in our actions by the interpretations we construct about particular phenomena. The improvement of complex phenomena such as e- teaching and e-Learning requires an understanding of the interpretive nature of this relationship.

The eventual aim of this research project is to produce four sets of analyses of Chinese and UK higher education teachers' conceptions of e-Learning: one examining Chinese higher education teachers conceptions; one examining UK higher education teachers conceptions; the third providing a comparative analysis of the two; the fourth examining how we can use these understandings of teachers' conceptions of e-Learning to help improve the teaching and learning processes in both countries.

In this paper, we report on the results of the interviews with Chinese higher education teachers who work in "conventional", campus-based institutions. We examine the ways in which these teachers think about e-Learning and e-teaching, the beliefs they hold about their "e" practice, the ways in which they implement e-Learning, the problems they face in incorporating e-Learning into their courses and the ways in which they perceive e-learners.

Methodology

Our research approach was based on existing research methodologies which emphasise a phenomenographic stance to the elicitation of teachers' conceptions of teaching and learning (for example see Prosser, Trigwell & Taylor, 1994; Roberts, 2001) followed by a grounded theory approach to data analysis and the development of categories of conceptions. We interviewed 24 higher education teachers in China. Our contacts in China provided us with access to these teachers, and we approached them via email or telephone to seek their participation in the project. The interviews were aimed at examining the phenomena of e-Learning from the perspective of each individual participant. Those interviewed were all involved in promoting or developing e-Learning in their higher education institution: they were e-Learning teachers, staff developers, researchers, e-Learning specialists and the like. The selection of participants was very important as we wanted to be sure that all interviewees had direct experience of designing and running courses that use e-Learning in one way or another so that they could talk knowledgeably and in depth about their experiences. By e-Learning we mean the use of digital devices such as computers, the Internet, the Web, Virtual learning Environments (VLE's), hand held devices and so on to organise or carry out learning and teaching.

This paper considers the preliminary results from the interviews of higher education teachers in China.

The interviews

In this second order perspective, we view conceptions of e-Learning to be at the interface between an individual's practice and the particular context in which they are working. Conceptions are therefore likely to be dynamic (Prosser, Trigwell & Taylor, 1994) and open to change depending on circumstances. They are, however, likely to be embedded in teachers' belief systems (McConlogue, 2003) and likely to indicate an underlying set of values about e-Learning and teaching: conceptions, beliefs and values of this kind are most often tacitly understood by teachers and most teachers are unlikely to be able to articulate them without some assistance or prompting.

There were three stages to each interview:

1 *History:* at the beginning of each interview we asked participants to relate a short biographical history of their teaching career. As well as acting as an icebreaker, the biography gave voice to participants. Biography “can help bridge the gap that has grown between the practice of teaching and the practice of studying teaching” (McEwan, 1995; 166)

2 *Case study:* this was the central part of the interview, where participants talked about their learning and teaching practice, ideas, beliefs and conceptions of e-Learning. Teachers’ knowledge of their beliefs, values and practices is likely to be in part tacit. Beliefs exist “at an implicit level and may therefore be difficult to articulate and identify and hence difficult to unearth and examine” (Tann, 1993: 55–56, as cited in McConlogue, 2003). Because of this, we tried to help teachers unearth their conceptions by the use of stimulated recall in which we asked them to think about specific examples of their teaching as it relates to e-Learning so that they could bring this to the fore as a source for discussion. Stimulated recall is a way of discovering what a person was thinking at a ‘critical’ moment’ of action.

3 *Future:* We asked participants to tell us about future plans for using e-Learning in their teaching. This allowed them to think ahead to where they thought e-Learning was going, and to consider what they might be trying to achieve in their future practice. This also acted as ‘closure’ to the discussion, allowing us to thank them for their time and participation and for them to ask us questions about the project.

The interview method was piloted in China in January and February 2006, and revisions to the methodology carried out. The first full set of interviews was carried out in March to June 2006. The interviews were conducted in Chinese and audio recorded with participants’ permission. Transcripts in Chinese were prepared from the recordings, and these were then translated into English for analysis. Each interview took place in the participant’s office or other suitable place, and took between one and two hours.

Analysis

The interviews were analysed in two stages:

Each interview was examined separately as a case study. Each transcript was read through and notes made in the margins highlighting particular issues of potential interest to us. The transcript was then read again and the original notes were expanded into a narrative about the participant’s conceptualisations of e-Learning. This expanded narrative allowed us to get an in-depth understanding of each person’s beliefs and values. We were able to draw-out the unique features of each case. These in-depth case studies proved to be rich in data and presented the participant’s conceptions of e-Learning within the particular and unique context of their place of work.

Having examined each case in turn, we then analysed across cases, comparing one interview with the other and drawing out similarities and differences between cases. This led to a provisional set of categories. At this point, one of us (Zhao) went back to the original Chinese transcripts to check that the translation of certain words and phrases into English was consistent across transcripts. We then double-checked each category until we felt they were stable. The aim here was to develop a set of grounded categories that expressed all the conceptions of e-Learning held by the participants. (Charmaz, 2000).

Results

The open-ended, wide ranging nature of the interviews allowed participants to explore their conceptions of e-Learning in relation to the particular higher education contexts in which they taught. In this paper, we discuss a preliminary set of categories of conceptions.

The centrality of the lecture
Every teacher we talked to emphasised the importance of the lecture method in the Chinese higher education system. The traditional 2–3 hour long face-to-face lecture method is for many of these Chinese

teachers still the favoured method of teaching. Even when there is good student access to technology, and where arguably e-Learning could be implemented, many of the higher education teachers interviewed said they still prefer the lecture, and indeed many still consider it to be the method most likely to lead to "mastery" of theoretical material and good quality learning outcomes. One interviewee went as far as to state that mastery of theoretical material "cannot be achieved online" and could only be satisfactorily achieved in the setting of the face-to-face lecture.

We cannot over emphasise the importance attributed by these teachers to the lecture method in the Chinese higher education system. Despite the enthusiastic interest shown by all those interviewed, and despite their personal eagerness to adapt e-Learning strategies into their practice and the value they placed on e-Learning, no one talked of e-Learning as being a central teaching and learning method, or of it being possible in China to run courses in conventional universities completely via e-Learning. The lecture, delivered by an authority figure, is the central vehicle for transmitting knowledge. It seemed impossible for these teachers to imagine a Chinese higher education system that did not place the lecture at its centre. From this position, all other considerations about teaching and learning seem to flow.

Online co-operative learning

The incorporation of cooperative learning methods into e-Learning strategies appears to be reasonably well understood by many of those interviewed. This form of e-Learning was described by them as involving the teacher delivering a face-to-face lecture, which is followed by students working online, often in groups, on cooperative tasks suggested by the teacher in order to consolidate their learning. Our analysis of the interviews shows that Chinese higher education teachers think that the introduction of online cooperative learning into their teaching practice helps the teaching and learning process in a number of useful ways:

a) It "excites" students by involving them in using new technologies such as learning platforms and discussion groups, which it is assumed will bring a large element of interest and motivation to their learning;
b) "painful" and "boring" learning associated by students with lectures can partly be overcome;
c) It provides a way of compensating for the draw-backs of the lecture method. Those interviewed said that online cooperative learning provides a means for introducing social (group based) learning methods in which students can discuss theoretical and conceptual issues, and carry out small-scale cooperative group projects. Participants expressed the view that the traditional face-to-face lecture does not include opportunities for teacher-student communication, nor for student-student communication of this kind;
d) Students have the opportunity to explore their 'tacit', or taken for granted, knowledge through discussion with their peers;
e) Students have access to more and richer "e" learning materials in these settings;
f) It is anticipated that online cooperative learning should lead to "good results" (*learning outcomes*) from their students;
g) Online co-operative learning provides students with the opportunity to learn "how to behave" in social settings and how to form relationships with each other. This, again, is something that does not occur easily in the lecture-only format of higher education teaching in China;
h) Costs can be saved, as large classes can be taught by one teacher;
i) Improvements in the "efficiency" of the teaching process can be achieved.

All those interviewed were familiar with the possible theoretical applications of online cooperative learning, and several of them were trying to implement it in their practice. However, despite the theoretical benefits to them of employing cooperative learning methods, everyone interviewed noted that there are many problems with this form of e-Learning in the context of the Chinese higher education system:

a) It is time consuming for the teacher: with large class sizes of 40–60 students, teachers say they spend too much time trying to look after the online groups and in answering student queries and questions.
b) In practice, online cooperative learning leads to poor learning results and outcomes compared with other means.

c) Despite trying to involve students in cooperative group work, teachers say competition is endemic in the Chinese higher education system, and that even in a cooperative learning setting, many students continue to be very competitive, which of course works against the cooperative learning ethic.
d) Group work, whether face-to-face or online, is experienced by students as being highly problematic because not everyone participates, yet often the same group mark is awarded to each individual in the group despite their level of participation, making it possible for many to “free ride”. This can cause students to question the benefits to them of participating.
e) Online participation by students is, on the whole, poor. Most students will only participate if the teacher leads the discussion or poses questions. Students rarely take the initiative in leading a discussion or posing questions to other students. When they do ask questions, they are often targeted at the teacher and are about examination requirements and other administrative issues.
f) Online cooperative learning is still inherently teacher centred: despite the cooperative learning rhetoric, it seems some teachers still see this method as being largely about requiring students to grasp the theory that was taught in the lecture, rather than perhaps exploring concepts and participating in discussions of their own choice, or discussions leading to diverse outcomes.
g) Some teachers say students still prefer the traditional face-to-face lecture in which the teacher as expert directs students about what they should learn and what is needed to pass the end of course examination.

Network Learning
In many interviews, teachers discussed their use of “network learning”. This was described as a form of resource-based learning, where material (often in the form of a text book) is placed online and students are expected to learn it on their own. This process was described by one interviewee as a form if “individuation”. It is a quick and convenient form of e-Learning which can be applied to the masses. One teacher described how he taught classes of 300 students via network learning, and said this was not unusual. Those interviewed talked of network learning as a way of providing courses to the public, who are off-campus. There was scepticism about the quality of this form of e-Learning, with questions about its ability to ‘improve’ learning. It is considered quick and convenient, but not of a high quality. Yet from what those interviewed said, it seems ubiquitous throughout some parts of China.

Student Learning
The ways in which students are asked or expected to learn by teachers is an important aspect of the change that occurs when e-Learning is introduced into higher education. Questions were raised by some of those interviewed about the ability of the Chinese student to participate in forms of e-Learning that are based on “self-study” methods. It seems Chinese students are not well equipped for this kind of learning and, in many cases, still expect the teacher to teach them everything. In relation to this issue, one interviewee characterised students into two types: the “City-bred” student, who is usually a single child and whose maturity is “brittle”; and the “Country-bred” student, who is earnest and frank:

> the students of Kang university have a character, they are from the city, dress-up fashionably. And then almost all are singleton, are coddled since childhood at home. Therefore….I find that they are excellent in drawing etc, but the brittle degree of their mentality is also strong…..The class is different in Nanhai, they are from city and country. You will find this very obvious, will feel that (these) children are especially weak to (learning) new things….their thinking is not so active. However, they are frank. Their origins are different (interviewee).

The implication here is that to involve students with such diverse origins, expectations of learning and approaches to learning in online e-Learning methods that are based on self-study and autonomy would, in many cases, be extremely difficult. The cultural shift required by students to cope with self-study, or to re-asses their role in the teaching and learning process especially in an e-Learning context, would be enormous and for many beyond their present ability. Teachers said that the shift away from teacher-led, teacher-focused methods to “innovative” methods that call on students to exercise greater agency in their learning will be slow to emerge, even in face-to-face contexts.

Infrastructure and access

Effective e-Learning necessarily relies on there being a well-resourced technical infrastructure, and for those involved having consistent and stable access. The situation in China with regard to these issues is changing. It appears to be very patchy and seems to depend on the resources and social and political context of each institution. The higher education teachers that we interviewed work in reasonably well-resourced universities. But even here infrastructure and access can be poor, or poorly supported, so making the promotion of effective e-Learning problematical.

For example one person who we interviewed compared the excellent technical infrastructure and access to computers in Hong Kong, of which she is familiar, with that in her own university in Beijing:

> In fact, the teacher wishes we can be in this kind of environment, and even sit at home, and in the office, not see the students, and implement all these things. But at present, it is not realistic. Many aspects still need to be improved. Not only the hardware environment, but also including some ideas *(about how to make e-Learning work)*, some theoretical findings, some constructions of the software environment, and some sharing materials, which are good for the course learning, are all the elements that must be considered in the development process of the e-Learning (interviewee).

Another teacher who indicated a keen willingness in the interview to embrace e-Learning and all that it had to offer talked realistically about the present cultural and political context of higher education in China and how, even if access to technology and infrastructures was at the level found in many western countries, it may still not be possible to fully embrace it:

> We admire the environment in the western countries very much. For example I can learn even lying on the lawn with a notebook computer. I think this will let the students out, and in fact, in the process of letting them out it can also exercise a kind of self-conscious competence or open mind in them. But the environment in our country maybe does not allow this…(interviewee).

Clearly, although infrastructure and access are important determinants of effective e-Learning, there are also important cultural and political issues that also intervene.

Discussion

This research into the conceptions of e-Learning and teaching held by higher education teachers in China provides a fascinating, but necessarily partial window into the world of higher education in China today. Because of their particular position as e-Learning practitioners and advocates for e-Learning in their university, those interviewed are university staff who we might expect to be knowledgeable about e-Learning and be in a position to implement it in their own practice, and to influence its implementation across their particular institution. They are not uncritical about the state of e-Learning in China, and are realistic about its potential as a mainstream method of teaching and learning.

The teachers we interviewed exist, however, in a teaching and learning culture that has been dominated by the lecture method for centuries (Gu, 2006), and without exception each of them acknowledged the overwhelming centrality and sheer power of the lecture in the Chinese higher education system. This perception of teaching and learning is not uncommon in China. Indeed, anything other than the traditional, campus-based form of higher education is universally considered second or third rate (Gu, 2006). E-Learning seems to be relegated by many teachers to a third class form of education. Even the traditional correspondence course is considered by many to be of a higher quality.

Teachers interested in e-Learning in China face many issues that will impinge on their ability to incorporate the use of information and communications technologies into mainstream higher education. One issue is the size of classes in China, which can be large, usually between 40–60 students. In the case of network learning courses, some classes have as many as 300 students. In such contexts, the opportunities for innovating are not high. Incidentally, it is interesting to note the different meaning of network learning in the Chinese context, where it refers to a largely resource-based form of online learning in which learning material is "broadcast" to the masses and in which there is little student-to-student communication, and even less student-to-teacher communication. It is a delivery system in which individual students receive course material and are expected to learn it on their own. This is in contrast to western network learning practice which involves “learning in which information and communications technology (ICT) is used to promote connections: between one learner and other learners; between learners and tutors; between a learning community and its learning resources.” (Goodyear, Banks, Hodgson and McConnell, 2004: 1). There is little if any sense of “community” in the Chinese meaning of network learning.

Another feature of the Chinese higher education system that may impact on the incorporation of e-Learning into mainstream practice is the way in which teaching is organised. The teachers interviewed in this study organise and run courses by themselves. There seems to be little understanding of team teaching or of how courses can be produced and taught by teams of teachers working together. Higher education institutions appear to provide little support for working in this way. And incidentally, there appear to be few opportunities for higher education teachers to benefit generally from staff development initiatives. Indeed we were told by many of those we talked to as part of this research that taking part in this interview study provided them with a unique and valuable opportunity to share their ideas with a willing listener and discuss trends in e-Learning innovation. It therefore appears that it is difficult for any individual teacher working in a conventional on-campus setting to find out about innovations in learning and teaching generally, and about e-Learning in particular, in order to assist them in their professional development and to make the move from the traditional face-to-face lecture to online or e-Learning.

The issues faced by teachers are of course only one part of the picture. Students have to be open to change and need to have an understanding of the potential benefits to them of innovations in learning and teaching, especially those requiring them to participate in socially situated collaborative and cooperative forms of learning. We have seen that students’ ability, or willingness, to participate in forms of learning that require them to be more autonomous and to manage aspects of their own learning is a potential barrier to the introduction of forms of e-Learning that are widely practised in western countries. This adds another complex layer to what is already a complex situation in the culture of teaching in Chinese universities. As long as the lecture method dominates, and as long as the teacher continues to be seen as the sole expert disseminator of knowledge and as long as the end of course examination continues to be the major important source of judgement about learning outcomes, forms of e-Learning that have become widely established in western countries are not likely to become easily established in the Chinese context. As Yu Minhui puts it:

> students are often told that the key task for them is to make great effort to achieve the excellent scores in exams, because regardless of how actively you participate in the classroom activities and discussions, exam performance is the only means to assess whether or not you are a good student, in other words whether or not you will be successful in your lifetime. Under those conditions, it is impossible for students to bridge the connection between the function of their participation in classroom interaction and their learning outcomes (Yu Minhui, 2006)

Another issue faced by these teachers is the lack of technical support offered by their universities. Most higher education institutions do not seem to have the appropriate technical infrastructure to support e-Learning. Many of those interviewed teach in reasonably well-resourced institutions (by Chinese standards), but even in these contexts student access to computers is very low, and the on-campus e-Learning infrastructure is weak and cannot easily support large numbers of online learners. The resources that teachers can provide online are still poor. Students studying at the post-graduate level have little access to research resources such as e-journals and research data-bases. Full access to the Internet and the resources available on it is still problematic for most campus students, and indeed for the wider society in China, although this is changing.

Conclusion

In this study, we set out to investigate the state of e-Learning in higher education in China by interviewing teachers in Chinese universities who use e-Learning in their day-to-day practice. From a second order perspective, we constructed a set of preliminary grounded categories describing the conceptions of e-Learning and teaching held by these teachers. The *lecture method* is still central to the Chinese higher education system and is unlikely to be superseded by any other method in the near future. The lecture is considered by many to be the only way to pass on knowledge of any substance. Indeed, it is the teaching method by which all others seem to be compared. Nevertheless, e-Learning methods that have been tried and tested in western countries such as *online co-operative learning* are being introduced by small numbers of teachers wishing to innovate in their practice and who have the resources and understanding of how to organise learning in this way. Success is not universal: many students resist working collaboratively or do not know how to do so. The long tradition in China of competitive learning is hard to throw off. Assessment strategies work against student participation in online discussions. Learning outcomes are not always at the desired standard. Despite this, some of those teachers we talked with indicated a commitment to forms of e-Learning requiring students to work together in cooperative groups. They believed in the social and intellectual benefits to their students of this form of learning. The most ubiquitous form of e-Learning mentioned by those interviewed is *network learning*. Unlike its western counterpart, which has a focus on promoting connections, and in networking students and tutors in the context of a rich variety of resources, the Chinese conception of network learning is a form of learning in which packaged learning material is broadcast to masses of off-campus students. There is little real attempt at facilitating connections between learners. It is described as being an efficient way of distributing course materials. Students and *student learning* are of course at the centre of any form of higher education. Those interviewed had some concerns about the ability of Chinese students to adapt to self-study methods and other forms of self-management that may be required in e-Learning contexts. There is still a high teacher dependency culture in China that militates against student autonomy. Finally technological *infrastructure and access* to computers in most universities is still poor compared with that in western countries. The state of e-Learning in the universities in which these teachers work is however dynamic and changing.

Looking to the future, the results of these interviews suggest that those who are already involved in the field of e-Learning in China share a common future model of e-Learning. This might best be described as the “Lecture plus Online Work” model. This model involves the teacher giving a face-to-face lecture on theoretical or conceptual issues, followed by ‘homework’ carried out by students in an online learning platform. The online homework may involve students participating in group tasks and discussions, with opportunities for students to ask questions of the teacher. Many of those interviewed said this was the most likely way forward for e-Learning in the Chinese higher education system as it supports the traditional lecture method, which many see as being the basis of high quality student learning, while offering students opportunities to interact and communicate in ways that are not currently possible in the lecture itself. This model appears to address the issue of large class size, as it (theoretically at least) provides a way for teachers to organise students into smaller groups with a focus on interaction and communication online:

> With all these students, we need to solve the problem of too many students with too limited classrooms….So I want to make some revolutions to reduce all the classes to about 60 students a class with small (online) tutorial groups (interviewee).

A change of this kind would amount to a radical shift in the Chinese higher education learning and teaching process. There are signs that such a shift is occurring, but only among those enthusiastic teachers who are already involved in e-Learning, which is a minority of teachers. The strength of educational traditions and the inherently conservative nature of Chinese higher education suggest that any wider shift to some kind of mainstream e-Learning is some considerable way off.

References

Banks, S., Lally, V., Liu, B., & McConnell, D. (2006). Intercultural e-learning: Reflections on Developing a Collaborative Approach to Pedagogy and Educational Technology in a Sino–UK Context. In Banks, S., Hodgson, V., Jones, C., Kemp, B., McConnell, D., & Smith, C. (Eds.) *Proceedings of the Fifth International Conference on Networked Learning 2006*. Lancaster: Lancaster University. Available at: http://www.networkedlearningconference.org.uk/abstracts/pdfs/03Banks.pdf

Charmaz, K. (2000). Grounded theory: Objectivist and constructivist methods. In N. Denzin, and Lincoln, Y.S. (Eds.). *The Handbook of Qualitative Research* (pp. 509–535). Thousand Oaks, CA: Sage Pubs. Inc.

Dahl, S. (undated) *Intercultural Research: The Current State of Knowledge*. London: Middlesex University Business School.

Entwistle, N. (2005). Ways of thinking and ways of teaching across contrasting subject areas. Paper presented at *The 13th Improving Student Learning Symposium*, Imperial College, London, UK, 5–7 September 2005. Available at: http://www.brookes.ac.uk/services/ocsd/1_ocsld/isl2005/abstracts/research_papers/entwistle.html.

Entwistle, N., & Walker, P. (2000). Strategic alertness and expanded awareness within sophisticated conceptions of teaching. *Instructional Science*, 28(5-6), 335–361.

Goodyear, P., Banks, S., Hodgson, V., & McConnell, D. (2004). Research on networked learning: an overview. In P. Goodyear, Banks, S., Hodgson, V., & McConnell, D. (Eds.) *Advances in Research on Networked Learning* (pp. 1–9), London: Kluwer Academic Publishers.

Gu, Y. (2006) An ecological model of e-learning in Chinese context-critical reflections of 5 years' practice of e-learning management in *IBOE. Studies in Continuing Education*, 28(2), 99–120

Kember, D. (2000). A reconceptualisation of the research into university academics' conceptions of learning. *Learning and Instruction*, 7(3), 255–275.

Kember, D., & Kwan, Kam-Por, (2000). Lecturers' approaches to teaching and their relationship to conceptions of good teaching. *Instructional Science,* 28, 469–490.

Marton, F., & Booth, S. (1997). *Learning and Awareness*. Mahwah, N. J.: Lawrence Erlbaum and Associates.

McConlogue, T. (2003). *An Investigation into the Educational Beliefs and Knowledge of Distance Education Online Tutors*. PhD thesis, University of Sheffield (supervised by D. McConnnell).

McConnell, D. (2006). *E-Learning Groups and Communities*. SRHE/OU Press.

McEwan, H. (1995). Narrative understanding in the study of teaching. In McEwan, H. and Egan, K. (Eds.) *Narrative in Teaching, Learning and Research* (pp. 166–183). New York: Teachers College Press.

McLean, M. (2001). Can we relate conceptions of learning to student academic achievement? *Teaching in Higher Education*, 6(3), 399–413

Pratt, D. (1992). Conceptions of teaching. *Adult Education Quarterly,* 42(4), 203–220.

Prosser, M., Trigwell, K. & Taylor, P. (1994). A phenomenographic study of academics' conceptions of science learning and teaching. *Learning and Instruction*, 4(3), 217–231.

Roberts, G. (2001). *Teachers' Conception of, and Approaches to Technologies for Teaching and Learning*. PhD thesis, Lancaster University, Lancaster, UK.

Tann, S. (1993). Eliciting student teachers' personal theories. In Calderhead, J. and Gates, P. (Eds.) *Conceptualizing Reflection in Teacher Development* (pp. 53–69). London and Washington, D.C.: The Falmer Press.

Yu M., (2006). *An Investigation into Participation in Classroom Interaction by Chinese Overseas Students.* MA dissertation, Department of Educational Studies, Lancaster University, UK.

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Electronic delivery of oral feedback on graphic design projects

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The characteristics of feedback that support students' learning have been described. However, the learning preferences of today's students (e.g. use of current technologies, expectation for flexibility and immediacy), when combined with the declining amount of time students spend on campus, may translate into particular expectations about the mode of delivery and time and place of receipt of assessment feedback. This study reports graphic design students' and their teacher's perceptions of the advantages and disadvantages of oral feedback recorded on an ipod and emailed to students as a digital voice file. Students' questionnaire responses suggest the advantages of this mode of delivery outweighed the disadvantages and support the learning preferences of this m-learning generation. For time-poor university teachers seeking to balance the tensions between timeliness, quantity and quality of feedback for student consumers, who are frequently not on campus to receive that feedback in a face-to-face session, electronic delivery of pre-recorded oral feedback may be one way to meet students' learning preferences.

Keywords: electronic, oral feedback, assessment, graphic design

Introduction

Assessment shapes learning (Brown, 2001; James, McInnes & Devlin, 2002; Munn, 2003) and feedback is critical to learning through assessment (Blayney & Freeman, 2004; Higgins, Hartley & Skelton, 2002; Mutch, 2003; Yorke, 2003). Researchers generally agree on principles of effective feedback and characteristics of constructive delivery (Brinko, 1993; Nicol & Milligan, 2006). They have also noted that giving effective feedback is not as easy as it might appear from the lists of good practice. Composing feedback is a balancing act.

University teachers need to negotiate a balance between timeliness, quantity and quality of feedback on student assessment products. This balancing takes place in a context in which university teachers perceive that the time available to compose individual feedback is contracting, as the number of students is increasing, and the demands of research, administration and community service expand. Feeling that the "burden of assessment is becoming unmanageable" university teachers seek ways to "save energy and time in giving feedback" to their students (Race, 2003, pp. 42, 44).

Students are also time poor (McInnis & Hartley, 2002). The demands of part-time work reduce the time students spend on campus for lectures, tutorials, and individual face-to-face feedback consultations with their university teachers. Today's students see higher education as a service; they expect feedback as part of that service (Higgins et al., 2002). These student characteristics, when combined with students' "unique attachment" to new technologies (Raine, 2006, p.3), may translate into particular expectations about the mode of delivery (electronic), and the time and place (any time, any place) of receipt of assessment feedback

In art and design schools oral feedback is critical to learning and creative design outcomes. Giving and receiving oral feedback is a generic skill required by all employers. Design students receive oral feedback on their projects in a 'crit' or design critique session. For the student, 'crit' sessions can be an intimidating. They are a public examination (in front of other students and teachers) of a work that has never been viewed before, and indeed, may be in a developmental stage, rather than a finished product. For the university teacher, giving face-to-face oral feedback in a design critique session is stressful, emotionally draining and time consuming. The teacher has to give feedback that is encouraging and motivating, that may contain negative elements, often without adequate time for reflection and preparation of a response prior to the feedback interaction. Oral feedback recorded and delivered electronically has the potential to reduce the difficulties encountered by both students and teacher in the current design feedback context.

Method

The research reported in this paper is part of a larger action-orientated inquiry (Taylor & McCormack, 2006) in which final year graphic design students, a design teacher and her colleague collaborated to develop, trial and revise, a checklist for giving constructive oral critique, both online and face-to-face. Reported here are the perceptions of the teacher and the students where oral feedback on a design project was recorded on an ipod and emailed to students as a digital voice file rather than being given orally in a face-to-face ‘crit’ in front of peers and other teachers. The question of interest in this cycle of the action inquiry was: what do graphic design students, and their teacher, perceive to be the advantages and disadvantages of electronically delivered oral feedback on design projects?

Students’ perceptions of the feedback were gathered using a questionnaire. Two scaled and two open-ended questions were of particular interest to this investigation: Did the recorded oral feedback emailed to you help you learn (yes/no); Did you listen to the feedback more than once (yes/no); if yes, how many times did you listen to the feedback; In what ways did receiving feedback electronically help you learn? and In what ways did receiving feedback electronically hinder your learning? Twenty students from the semester 1 2005 cohort (67% response rate) completed an emailed questionnaire. In 2006 only 15 students from the semester 1 cohort (25% response rate) completed the emailed survey. The poor response rate to the 2006 email survey led the authors to ask the students to complete a paper version of the survey at the beginning of second semester (response rate 70%). Students’ responses were consistent across the 2006 email and paper questionnaire. The 2006 responses reported below are those of students completing a paper survey.

Results

All 2006 respondents, and all except one student in the 2005 group, felt that the feedback emailed to them helped them learn. Privacy, immediacy, convenience (and accessibility) and the opportunity to listen, and re-listen, to the feedback were the advantages most frequently mentioned by students.

Seventy percent of the 2005 survey respondents, and ninety five percent of the 2006 respondents, listened to the feedback more than once. The comments of two 2006 students were typical “I was able to listen to it as many times as required” and “I could repeatedly reflect on what needed to be improved”. Being able to return to the feedback allowed students to hear the multiple messages in the feedback. During face-to-face feedback students often miss learning opportunities as they are concentrating on an earlier comment rather than the comment currently being delivered. “Being able to replay the message again and again alerted me to the things I needed to address” (2005 student).

Listening could occur at a time, and in a location, of the student’s choosing. “It was good to sit at home, where it’s nice and quiet, and listen to the feedback” (2005 student). This more relaxed environment facilitated the reception of critical feedback. The feedback was experienced as “less intimidating” (2006 student). Tone of voice allowed students to hear the emotion and emphasis in the teacher’s comments: “You could understand what the teacher was talking about through the tones in her voice” (2005 student). Some students in both year groups mentioned that electronically delivered oral feedback was “more personal” (2006 student).

Few students identified aspects of the feedback delivery that hindered their learning. Loss of opportunity to interact with the teacher, to clarify comments or to ask questions, was mentioned as a disadvantage by a small number of students. One 2005 student for example, noted that while online feedback was valuable during the developmental phases of a design, face-to-face consultation would “be more beneficial during the closing stages of the project, as it will be more of a conversation, give/take, idea-bouncing”. Four 2006 students suggested “it would be good to have face-to-face feedback as well”.

The teacher identified several time-related advantages. There was time for thoughtful construction of the feedback messages, time to elaborate on a point if needed and the opportunity to edit the comments before sending them. The construction of feedback in a personally comfortable environment, at a time convenient for the giver, was also an advantage. After all feedback had been returned the teacher felt that she had saved both time and energy as indicated in the following comment.

> The greatest advantage to the teacher is that it takes considerably less time to deliver considerably more effective feedback. Written feedback for GD4.2 2004, took 6 staff approximately 5 days to complete a tick box form with approximately 100 words of comment. By comparison in a similar subject, recorded feedback for GD4.1 2006, took 2 staff 2.5 days to complete and deliver with approximately 400 words of specific comment.

The teacher noted a potential advantage where there are multiple markers as is frequently the case in design assessment. Staff can listen to each other's feedback. This can increase the consistency of marking and feedback across classes within a student cohort. A disadvantage for the teacher as the giver of the feedback was that she could not see the receiver responding to the feedback to adjust the feedback in response to the receiver's reactions. She felt that this mode of delivery required the giver to have a wider design critique vocabulary and a higher level of competency and confidence to use it constructively.

Concluding remarks

This paper has presented the advantages and disadvantages, reported by final year graphic design students and their teacher, of oral assessment feedback recorded and delivered electronically. The use of technology, combined with the immediacy, privacy, convenience and accessibility of the feedback and the opportunity to listen multiple times, was reported by students as helping them learn. The demands of face-to-face feedback on the time and energy of university teachers and the need for careful management of the process to avoid confrontation have been noted by researchers (Mutch, 2003; Race, 2003). In this graphic design context both students and the teacher felt that electronic recording and delivery of feedback reduced the impact of these challenges. The advantages of electronic recording and delivery of oral feedback noted in this study may carry over into other professional learning/feedback contexts such as oral feedback to students on workplace or clinical placements.

Generalisation beyond this project is limited by the small number of respondents and the absence of an in-depth understanding of the student experience. Interviews with students could probe more deeply the ways in which electronically delivered feedback is experienced by students as different from, or similar to, face-to-face feedback and written feedback. Conversations with students could also identify the ways in which students go about deciphering the feedback and close textual analysis of transcripts of the feedback could identify the academic discourses on which the language of feedback is based. Questions such as, are we sacrificing quality for convenience, remain to be addressed as this investigation continues.

University teachers seek ways to enhance student learning by improving feedback. However, feedback is a relatively under-researched area (Higgins et al., 2002; Mutch, 2003; Nicol & Milligan, 2006). In addition, most studies of students' perceptions of feedback in higher education learning contexts have focused on written feedback (Maxwell, 2005) or relate to the use of technology no longer available to, or in demand by, today's university students (Black, 1992; Kirschner, van den Brink & Meester, 1991). A clearer picture of how feedback relates to learning, the factors that affect how students receive and interpret feedback, how students use feedback, the influence of mode of delivery and receipt on students' perceptions of usefulness of the feedback, and the implications for assessment feedback of the learning preferences of the m-learning generation, is needed.

References

Black, K. (1992). How to improve learning with a productive method for providing feedback. *Bulletin of the Association for Business Communication*, 55(3), 69–72.

Blayney, P., & Freeman, M. (2004). Automated formative feedback and summative assessment using individualised spreadsheet assignments. *Australasian Journal of Educational Technology*, 20(2), 209–231.

Brinko, K.T. (1993). The practice of giving feedback to improve teaching: What is effective? *Journal of Higher Education*, 64(5), 574–593.

Brown, G. (2001). *Assessment: A Guide for Teachers*. Assessment Series No. 3, Learning and Teaching Support Network Generic Centre. http://www.ltsn.ac.uk/application.asp?app=resources.asp&process=full_record&section=generic&id=3 [viewed 29 Sep 2006].

Higgins, R., Hartley, P., & Skelton, A. (2002). The conscientious consumer: Reconsidering the role of assessment feedback in student learning. *Studies in Higher Education*, 27, 53–64.

James, R., McInnes, C., & Devlin, M., (2002). *Assessing Learning in Australian Universities*. University of Melbourne: Centre for the Study of Higher Education.

Kirschner, P.A., van den Brink, H., & Meester, M. (1991). Audiotape feedback for essays in distance education. *Innovative Higher Education*, 15(2), 185–195.

Maxwell, B. (2005*).* Feedback as a tool to develop professional capability: Students' perceptions, experiences and use of feedback on a post-compulsory education and training initial teacher program. Paper presented at the *Society for Research in Higher Education Annual Conference New Perspectives on Research into Higher Education,* 13-15 December, University of Edinburgh, Scotland.

McInnis, C., & Hartley, R. (2002). *Managing Study and Work: The Impact of Full-time Study and Paid Work on the Undergraduate Experience in Australian Universities*. http://www.dest.gov.au/sectors/higher_education/publications_resources/profiles/managing_study_and_work.htm [viewed 2 Jul 2006].

Munn, T. (2003). *Effective assessment: Do students learn what we are teaching.* http://www.unisa.edu.au/evaluations/Full-papers/MunnFull.doc [viewed 29 Sep 2006].

Mutch, A. (2003). Exploring the practice of feedback to students. *Active Learning in Higher Education*, 4(1), 24–38.

Nicol, D. & Milligan, C. (2006). Rethinking technology-supported assessment practices in relation to the seven principles of good feedback practice. In C. Bryan & K. Clegg (Eds.), *Innovative Assessment in Higher Education.* (pp.64–77). London: Routledge Falmer.

Rainie, L. (2006). *Life Online: Teens and Technology and the World to Come*. http://www.pewinternet.org/ppt/Teens%20and%20technology.pdf [viewed 2 Jul 2006].

Race, P. (2003). *Designing Assessment to Improve Physical Sciences Learning*. http://www.physsci.ltsn.ac.uk/Publications/PracticeGuide/guide4.pdf [viewed 2 Jul 2006].

Taylor, M.J. & McCormack, C. (2006). Creative critique in visual communication. Effective feedback in design projects through voice centred traditional studio based communication and online delivery. Paper presented at the *Australian Council of University Art and Design Schools Annual Conference*, 27-29 September 2006, Melbourne, Australia.

Yorke, M. (2003). Formative assessment in higher education. Moves towards theory and enhancement of pedagogic practice. *Higher Education*, 45, 477–501.

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The role of e-teaching in e-learning

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Interaction has long been a defining and critical component of the educational process, and it has been suggested that asynchronous interaction may provide an ideal environment for learning. Promoting interaction requires rethinking of traditional learning and teaching roles, informed by research into learning and teaching activities, and the outcomes of such interaction. This paper presents the findings of doctoral research that used a grounded theory approach to generate insights into how participants interacted in an asynchronous, text–based discussion environment. A brief review of the impact of existing management structures on the introduction of learning is provided. The paper then presents the findings that emerged from the study and reflects on the teaching role that challenges some existing conceptions of a diminished role for teachers.

Keywords: computer mediated communication, teaching, learning, distance education

Introduction: An Australian e-education case study

The research used a grounded theory approach to investigated participant interaction in an asynchronous discussion forum designed to facilitate learner construction of knowledge. The context for this study was an education, post-graduate course offered at an Australian University. This topic is of interest as discussion forums were included in many online courses at the University and were also used in conjunction with on-campus courses. Their use is based on the belief that the forums would provide a vehicle for participants to interact and build their knowledge of discipline areas.

The course operated over a semester of 14 weeks as a fully online course, with no face-to-face component or printed media, with both national and international learners and teacher. One of the key design features of the course was the use of asynchronous discussion forums to facilitate interactive and collaborative learning**.** The forums that were the focus of the research were a series of "reflection" forums (Schön, 1991) where the learners reflected on discipline theory presented in the course, and how it related to their own professional context. The learners posted their personal reflections to a shared forum, and these postings were part of the assessment of the course and provided a foundation for the final assessment item. The course was one of the first courses specifically designed for e-learning at the University, and the research showed that the existing context, including management systems, impacted on the implementation of e-learning.

Institutional context: Moving from distance to e-learning

The University had offered print-based distance learning for over 25 years, and online learning since 1996. In this study the existing institutional context provided both opportunities and challenges for the introduction of e-education. Existing distance education systems provided a springboard for a systematic process for the creation and delivery of content, while design and development quality assurance processes and existing centralised systems to administer the learning management system, enrolments and learner queries were already in place. However, the existing processes for development of print-based content were transferred to the e-learning environment, which meant that opportunities to reconceptualise the learning experience were lost, with e-learning, in many cases, still conceptualised as the "delivery" of a product. Many courses were based on distance education print based courses, with the print content digitized and delivered online, and some interactive "add-ons", such as a chat facility or discussion forum. These add-ons were often of little pedagogical value so were ignored by students and the potential for interactive learning was lost. Zemsky and Massy's (2004) report on the failed uptake of e-learning in America, *Thwarted Innovation: What Happened to e-Learning and Why* suggested that the promised boom in e-learning did not eventuate as expected because e-learning took off before people really knew how to use it. When a new technology is introduced, such as online education, it creates the opportunity to innovate and change existing processes, however, the compression of the innovation process meant that new technology was introduced before educators and learners were prepared for the changed learning environment. The use of technology in higher education does not necessarily mean that there are improved learning outcomes, or a higher quality learning experience for the students. Research found that most university faculty who respond positively when asked “do you utilize e-learning?” reported that their principal use involved either a course management system like BlackBoard or WebCT, to distribute learning materials (Zemsky & Massy, 2004). These materials were often using online Power Point lectures, thus the basic teaching style remains largely unchanged. Most Faculty, even those who champion e-learning, still teach largely as they were taught (Laurillard, 2006).

Laurillard (2002) suggests that “the key issue is the quality and type of learning activity the communication media can support, and the role they play in the learning process as a whole” (p. 147). She suggests that the use of communications media in education is based on the assumption that students can learn through discussion and collaboration, even at a distance and asynchronously. Investigating this assumption was the focus of my doctoral research. Course design in this research was based on constructivist pedagogy and learning activities were designed to take advantage of interactive opportunities provided by communication technology. The research investigated the nature and function of asynchronous communication in facilitating learning.

Research findings

The grounded theory research (Strauss & Corbin, 1990) revealed that participant interaction was effective in generating knowledge within the e-learning community. From the grounded theory analysis of data from the participant postings in the reflection forums, a core category: “interaction as a facilitator of learning” and three supporting categories emerged. The supporting categories were “teaching role”, “building a learning community” and “generating knowledge”. The teaching role had three subcategories: structuring learning, facilitating learning community, and promoting cognitive learning. In keeping with the grounded theory approach, a detailed review of the literature was not conducted until the data analysis was finalised. Once the core and supporting categories were identified, they were compared to other findings in the literature. This revealed that the categories that emerged from my grounded theory approach confirmed and extended the findings of research conducted by The Canadian Institute of Distance Education Research (CIDER), the research arm of the Centre for Distance Education at Athabasca University, a Canadian Open University. The CIDER research into critical inquiry into a text-based environment (Garrison, Anderson & Archer, 2000) suggests there are three elements essential to an educational transaction: cognitive presence, social presence, and teaching presence. It was clear that the indicators and categories generated in this research through the iterative, grounded theory coding process were similar, although not the same, as several of the categories identified in the CIDER research.

An interesting finding of the study was the importance of the teaching role in facilitating the online learning community, and thus the generation of discipline knowledge. This finding challenges some existing literature that suggests teachers act as “a guide on the side” (Jones, 2006), which could be taken to indicate that teachers should step back from a proactive teaching role. However, this was not the approach undertaken in the course in this study. The data indicated that it was the active role the teacher played in creating a learning environment which enabled participants to collaboratively generate discipline knowledge. Based on these findings, it is argued that the active teaching role is important in both designing the e-learning environment and facilitating e-learning once the course is operational. This finding could be seen as conflicting with a constructivist approach to interactive education that moves the teacher away from the centre of the “instructional” activity and focuses on active student learning. It is argued here that this is not the case, as the teaching role promoted an active learning role. While the teacher was a co-constructor of the learning community and discipline knowledge, the role was as a facilitator of learning, not as the centre of the learning process. In order to develop a learning-centred approach, there are several design and facilitation activities the teacher can implement.

Activities to implement e-learning and e-teaching roles

Implementing e-learning provides teachers with technology to support constructivist pedagogy, in particular, an interactive learning environment. For this paper we will presume that educators support constructivist pedagogy, and are keen to implement an effective e-learning course, and not are being coerced into implementing e-learning. If directed by management to implement e-learning, it is likely that teachers will transfer unchallenged, traditional educational theory and practice to e-learning, and the opportunity to create interactive, learning centered environments lost. The e-learning environment may be new to many learners, and approaches to learning and expectations of the participants require clarification. Management should support teachers to develop a range of strategies to respond to the often conflicting expectations of stakeholders (students, management, industry, etc), that expect a teacher centred, content driven process; and contemporary educational theory that argues for learning centred, active, even self-directed educational processes.

Examining e-learning and teaching roles

The online environment creates an opportunity for new modes of teaching and provides access to different cohorts of students with different needs and expectations from on-campus students. Garrison and Anderson (2003) suggest that "e-learning is a disruptive technology in traditional institutions of higher education because it threatens the sustaining technology – the lecture" (p. 106). Despite other approaches, such as tutorials, group work, problem and self-paced learning, the lecture remains the dominant teaching strategy in many higher educational contexts. E-learning can fundamentally change the traditional transmissive approach to education, so its adoption creates a complex set of challenges for practitioners as they embrace new pedagogies, develop new technical skills and adjust to changes in their teaching role. Many of the skills teachers develop for on-campus teaching no longer apply in e-teaching, and so they must "unlearn" certain teaching methods as much as they need to learn new teaching approaches.

In this study the data revealed that well designed and moderated online discussion groups can operate as critical learning communities and that the teacher played several key roles in establishing and maintaining the critical learning community. These roles involved course design and implementation. The teacher can create an interactive learning environment through pre-course design activities, and then support a critical learning community by adopting a pro-active facilitation role, once the course is operational. In this study data revealed that the teacher was able to create a learning environment where learners used interaction to build a learning community and through that interaction, generate discipline knowledge. The challenge then is to design and facilitate an e-learning environment that incorporates the three essential components for learning focused interaction – the proactive teaching role, a supportive learning community and facilitated knowledge generation.

Given this central teacher role, resources to support and engage teachers in meaningful professional development and reflective practice are essential. Time is required for critical discourse to tease out what it means to be a teacher in the new millennium, how an e-learner is defined and what learning environments support these roles. Teachers are often required to work in teams to design and implement online courses, so course development timelines are often out of the teachers' control and ownership of intellectual property can also be an issue. The e-course is also in the public domain, open to scrutiny by peers, which is quite different from the more transient and relatively private nature of on-campus lectures. The tensions created by the introduction of e-education can be addressed through institutional planning and professional development. The changing teaching roles should be nurtured and supported.

In the study many participants were new to e-learning so an important component of the teaching role included explaining the design of the course and the structure of the learning experiences. In this study the teaching role included persistently reading and responding to forum postings to encourage and maintain dialogue. Anderson, Rourke, Archer and Garrison (2001) suggest that "the teacher's role is more demanding than that of other participants, and carries with it higher levels of responsibly for establishing and maintaining the discourse that creates and sustains the social presence" (p. 7). The commitment required by the teacher was demonstrated in an example of the number of responses to learner and teacher initiated threads in one discussion forum. The teacher initiated 4 threads, while the students initiated 13 threads. The teacher posted a total of 27 times, while the students posted 36, giving a total of 63 postings in the forum. While this quantitative data does not give any insight into the nature of the discourse, it does indicate that the teacher had an active role in responding to student initiated posts. In keeping with the constructivist philosophy that informed the course design, the data indicate that there was strong teacher presence as a facilitator, rather than director, to facilitate the building of a learning community. This was indicated by the small number of teacher initiated posts, however, the teacher still had a strong presence, demonstrated by the twenty-seven of the total of sixty-three postings in the forum. Garrison, Anderson and Archer (2000) suggest that:

> The binding element in creating a community of inquiry for educational purposes is that of teaching presence. Appropriate cognitive and social presence, and ultimately, the establishment of a critical community of inquiry, is dependent upon the presence of a teacher. This is particularly true if computer conferencing is the primary means of communication for an educational experience (p. 16).

Tension between interactive and independent learning

The e-learning environment creates is a tension between possibilities for interactive and collaborative nature of learning supported by communication technology and the flexibility and independence offered by the online learning environment. Current e-learning theory is based on a constructivist philosophy (Jonassen, 1999) and social learning theory (Lave & Wenger, 1991) that focuses on learning centred, collaborative and practice-based pedagogy. Constructivism recognises the dual nature of learning based on the learner constructing knowledge through individual reflection and social interaction. This approach challenges the traditional institutional teacher centred, transmissive pedagogy. While the educational value of using a social constructivist approach is supported in the literature (Jonassen, 1999; Karagiorgi & Symeou, 2005), individual constructivism is also a valid educational strategy. Achieving an educationally appropriate balance between individual and social constructivism, i.e. requiring participant interactions, or allowing independent learning, or a mixture of both approaches, requires further research.

Conclusion

The research showed that interaction was a key activity that enabled the participants to build and participate in an e-learning community. It revealed that the teacher had an important role in managing and facilitating an interactive learning environment, through both the design and implementation of the course. The teaching role was complex and integral in the building of a learning community and facilitating the generation of discipline knowledge. With research (Zemsky & Massy, 2004, Laurillard, 2006) showing that the basic teaching approach remains largely unchanged from traditional modes, and increasing interest in web becoming a medium for delivery (webcasting), the debate surrounding the role of teaching in learning centred pedagogy is an important discussion for higher education.

References

Anderson, T., Rourke, L., Archer, W., & Garrison, R. (2001). Assessing teaching presence in computer conferencing transcripts. *Journal of the Asynchronous Learning Network* 5(2).

Garrison, D.R. Anderson, T. & Archer, W. (2000). Critical Thinking, Cognitive Presence and Computer Conferencing in Distance Education. *American Journal of Distance Education*, 15(1), 7–23.

Jonassen, D.H. (1999). Designing constructivist learning environments. In C.M. Reigeluth (Ed.), *Instructional-design theories and models volume II: A new paradigm of instructional theory*. Mahwah, NJ: Lawrence Erlbaum Associates.

Jones, N. (2006). From the sage on the stage to the guide on the side: The challenge for educators today. *ABAC Journal*, 26(1), 1–18.

Karagiorgi, Y., & Symeou, L. (2005). Translating constructivism into instructional design: Potential and limitations. *Educational Technology & Society*, 8(1), 17–27.

Laurillard, D. (2002). *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies*, (2nd Ed). London, Routledge Falmer.

Laurillard, D. (2006). E-Learning in higher education. In P. Ashwin (Ed.) *Changing Higher Education: The Development of Learning and Teaching.* London: Routledge.

Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Schön, D. A. (1991). *The reflective practitioner: How professionals think in action*. England: Ashgate Publishing Ltd.

Strauss, A. & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques,* Newbury Park, CA, Sage Publications.

Zemsky, R & Massy, W. (2004). *Thwarted Innovation: What Happened to e-Learning and Why,* The Learning Alliance for Higher Education, University of Pennsylvania, USA.

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Learning object: A new definition, a case study and an argument for change

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A recursive definition of 'learning object' is proposed which supports the possibility of infinite variety in terms of how a learning object is constructed and used by teaching staff and students. The new definition is bound to two key properties of a learning object, reusability and use for learning, and places no theoretical limit on the size of a learning object. The proposed definition of learning object is derived from the development pattern that emerged during the course of a large collaborative project to develop a series of information literacy modules. The proposed definition is tested against the current generally agreed properties of learning objects, and against the outputs of the project from which the definition was derived. The new definition is also compared with some existing definitions and an argument is presented for why it may prove more useful, in both theory and practice, than its predecessors.

Keywords: learning object, recursion, reusability, granularity, SCORM

Introduction

Digital learning objects have been widely debated at least since 2000. After all this time, there is still no universally agreed definition of what they are (Kay & Knaack, 2005) and little evidence of their widespread adoption in Higher Education (Campbell, 2003). The recent view that "an object-oriented approach to teaching and learning resources is likely untenable" (Fill, Leung, DiBiase & Nelson, 2006) is supported by a recent blog post on learning objects from David Wiley:

> There have been lots of articles around the blogosphere of late ringing the death bell for learning objects. It's hard to tell if they're right or not, because no one can agree about what a learning object is

He goes on to say:

> I will here attribute learning objects' inability to live up to the incredible hype and investment they received to the fact that the premise of the possibility of simple reuse was simply wrong (Wiley, 2006).

Nonetheless there is a considerable body of research around learning objects, including from Wiley himself. Alison Littlejohn's edited collection of articles on reusing online learning resources demonstrates something of the scale and scope of research in this field (Littlejohn, 2003). Organisations such as Instructional Management Systems (IMS) Global, Advanced Distributed Learning (ADL), Centre for Educational Technology Interoperability Standards (CETIS) and others working in the elearning specifications and standards area continue to grapple with the concept. Major software companies including Blackboard, Macromedia, and Microsoft now support elearning specifications in their educational products. All of this suggests that whatever learning objects are they "ain't dead yet".

Information Literacy e-Learning Modules is a project funded through the New Zealand Tertiary Education Commission's e-Learning Collaborative Development Fund (eCDF). It is a two-year collaborative project between the University of Otago, Dunedin College of Education and Otago Polytechnic and at the time of writing we are one year into the project. The project was conceived to address four main areas in the tertiary sector associated with information literacy learning:

- Barriers to tertiary study which can occur as a result of poor information literacy skills and the diverse needs of marginalised, mature and distance students.
- A shortage of high quality online information literacy modules which are reuseable, portable and have pedagogical flexibility.
- A need for professional development opportunities for staff in the area of information literacy.
- A tertiary sector requirement for centrally maintained and managed, standards conformant online resources in this important foundation field.

Evaluation of the modules themselves is discussed elsewhere (Hegarty, Coburn, McDonald & Cone, 2006; Keen et al., 2006).

Achieving reusability of the information literacy modules across a range of digital platforms, both online and offline, in use in NZ tertiary institutions and in use by NZ tertiary students is a key goal. This project seemed like an ideal opportunity to try to apply the ideas behind learning objects in general and to work with the Sharable Content Object Reference Model (SCORM).

From the outset the desire for technical reusability, and the requirement for pedagogical coherence, that is, the need to provide a rich learning experience relevant to the needs of diverse groups of learners across the tertiary sector, set up a tension. This tension was anticipated and has been highlighted by many researchers, (e.g., Boyle, 2003; Fill, Leung, DiBiase & Nelson, 2006; Rehak & Mason, 2003). We set out to approach the problem from a practical rather than a theoretical perspective. Contract requirements with the NZ Tertiary Education Commission, (TEC) to produce a series of online modules suitable for use by students across the sector, within a defined time-frame, has helped us to retain a firm pragmatic focus.

What we found in developing the project was that while the definitions, debate and discussion around learning objects provided useful background they were all largely useless as pointers to practical techniques to help us to meet the pedagogical goals of the project itself and the requirements for reusability across the sector. In this context we found ourselves increasingly turning to broader Web standards and techniques and applying and reapplying them to meet the project goals. Nonetheless, through this development process a pattern of development activity emerged that has led to the definition of a learning object proposed here. The proposed definition is assessed against generally agreed properties of learning objects, and against the learning objects developed in the information literacy project. Finally the new definition is compared with some of the more common existing definitions of learning objects and an argument is presented for why the new definition may prove more useful in both theory and practice than its predecessors.

A pattern of development activity

The information literacy project is a collaborative project involving staff from three separate tertiary institutions. As a group, the three institutions represent a broad cross section of the NZ tertiary sector involving a polytechnic, a college of education and a university. A group of a dozen or so people comprising teachers, librarians, educational technologists and educational researchers are involved in the project. This group is to some extent fluid but with a central core of committed individuals from each institution. There was and always has been complete agreement about the broad goals of the project described above, but it became apparent in the early stages of implementing the project that with up to *n* different people involved in the collaboration there were at least *n* different ideas about how the modules would look and function. The process of moving from conceptual ideas in individual minds, to the construction of tangible things that can be visualised and interacted with, instantiated a pattern of development activity.

There are many theoretical and practical models that can be used to aid educational technology development projects by providing some guidelines for development activity. Some models come from educational design, for example, 4C/ID-Model (van Merrienboer, Clark & DeCroock, 2002) and the Conversational Framework (Laurillard, 2002). Others come from software engineering and interface design, for example, Spiral (Boehm, 1988), Rapid Application Development (Martin, 1991) and Paper Prototyping (Snyder, 2003). In the information literacy project we did not rigidly adhere to any particular educational development or software development model. Our educational approach was broadly constructivist and we used an open source content management system to create, and modify in response to ongoing feedback, the online modules. What most educational and software development models, and the development process we used, have in common is the description of a series of discrete stages and the description, or in our case the negotiation, of a set of rules or procedures for progressing from one stage to the next. The practical problem of sequencing stages is usually dealt with through allowing some form of iterative process as a result of feedback or evaluation from users.

The pattern of activity that emerged in the information literacy project is described below, and provides a general description of what actually occurred in the process of going from four very broad goals and objectives to five discrete digital information literacy modules that were required to be delivered at the end of the first year of the project. Broadly the pattern of development activity for the information literacy project can be characterised as follows:

Each of the starting goals began to decompose into sub goals with the processes of negotiation among team members about what the goals actually meant. The process of negotiation was repeated with sub-goals and the process repeated again and again until finally sub-goals decomposed into actions that resulted in the production of the online modules themselves. Frequently sub-goals were identified as unattainable. This usually occurred either because agreement could not be reached between team members that the sub-goal was essential to achieving its parent goal, or because a sub-goal was deemed to be counter to higher goals or counter to any of the four original goals of the project. When this occurred we were left with the parent goal. In other words we had travelled in a circle and had to either abandon the parent goal or renegotiate.

Three things are evident from this description:

1. the project may never have got started
2. the project may have started but failed to progress
3. the project may never stop.

An additional observation can be made: The process of negotiation between team members about goals, sub-goals and so on, in effect established the rules for constructing the modules. How the five complete modules, that we have produced, actually look and behave was not pre-ordained. How the five complete modules have turned out is just one among an infinite number of possible ways that they might have turned out. They have turned out the way they have because of the finite set of rules negotiated by the project team to construct the modules. Development of the five complete modules has stopped only because agreement has been reached about the rule for stopping!

This observed pattern of development activity looks very much like a recursive process and this is a central idea in the new definition of learning object that follows. Before proposing the new definition, it is worth taking a short detour to explain recursion; a concept from computability or recursion theory, (e.g., Godel, 1931; Turing, 1936) but with abundant examples in every day life. So, what is recursion?

A recursive definition is one which defines something in terms of simpler versions of itself (Hofstadter, 1979). It follows from this definition that a recursive process is one in which progressively more complex things are constructed from simpler versions of themselves. The simplest version must be obvious, self-evident or capable of being defined outside the recursive definition.

To illustrate these ideas consider the following sequence. Sentences 2–4 are each derived from the previous sentence. Sentence 5 is left to the reader to construct.

1. This is the car that Jill drove.
2. This is the cat that ran under the wheels of the car that Jill drove.
3. This is the man who saved the cat that ran under the wheels of the car that Jill drove.
4. This is the ticket to Wimbledon that Jill's mother bought the man who saved the cat that ran under the wheels of the car that Jill drove.
5. ...

The rules of grammar in any language are finite. Language itself is not (Fasold & Connor-Linton, 2006). The reason language itself is not finite is because all grammars incorporate recursive devices. This means that it is theoretically possible (albeit exhausting) to construct a sentence of infinite length. The example above, drawn from familiar childhood word games, demonstrates the effect of embedding (reusing) one sentence in another; this is an example of a recursive device. There is nothing ungrammatical about any of these sentences and the game above could go on in an infinite variety of ways for an infinite length of time.

To return to learning objects: Is it possible to define learning objects in terms of simpler versions of themselves? In other words, can they be defined in terms of the recursive process used to produce them? The following section proposes a recursive definition for learning objects which is informed by the pattern of development activity described.

Learning object definition

A learning object is the result of applying a finite set of rules to a simpler learning object, in order to construct some meaning, activity or purpose which is used for learning. The degenerate case of learning object is a digital element.

This recursive definition says three things about learning objects:

1 Learning objects *are* reusable because they are always defined in terms of simpler versions of themselves. The simplest object, from which one can create a learning object by applying some rules to construct meaning, activity or purpose, is a digital element.
2 A learning object is as big as it needs to be in order to construct some meaning, activity or purpose. There is no theoretical limit to the size of a learning object.
3 A learning object must be *used* for learning.

The finite set of rules in the definition can be equated with the goals and sub-goals of the developers of the learning object. Table 1 provides a concrete example of how this works. Note that only one sub-goal (a) is expanded into sub (sub-goals) in this example, and the original design goal is itself a sub(sub...(sub-goal)…) of one or more of the overall goals of the module and of the project itself.

Table 1: Expansion of a selection of design goals from the Information Literacy Project, Module 4, Writing a Science Report

Design goal	**Explain the use of tables in a science report**
Sub-goals	a. Provide a written explanation of purpose b. List the key formatting requirements c. Illustrate with an example d. Provide the opportunity for practice through critical examination of tables from existing reports. e. Provide an opportunity for assessment of own understanding of the use of tables in a science report.
Sub (sub-goals) a.	Construct the written explanation applying the rules of English grammar. Check for consistency and for any ambiguity with novice science report writers. Proof read the explanation. Format the explanation in the agreed module style.

What is a digital element? Is a word or a pixel a digital element? Is a blog or a learning management system a digital element? The answer is, it doesn't matter as long as whatever it is, is capable of having a finite set of rules applied to it in order to construct meaning, activity or purpose. Can an element be non-digital? The definition specifies that an element is digital because learning objects arose out of the digital domain. Again, it probably doesn't matter. Digital elements are required as the degenerate or limiting case of learning object. This is essential if the definition is to avoid infinite regress but it is important to realise that this does not mean that a digital element is equivalent to a learning object; it is not.

In order to be a learning object, a learning object must be used for learning. As noted, a major stumbling block in the information literacy project was negotiating the tension between technical reusability and meeting diverse pedagogical needs. Our approach to resolving this was to ensure first that each module met a specific need, drawn from any of our collaborating institutions, and that the module was used by students to evaluate whether the need had been met. We dealt with the provision of mechanisms by which the module or any part of it can be easily adapted to meet similar needs drawn from any other institutions second. This approach and our proposed definition are consistent with Wiley's observation that, "If the educational resources we create don't meet our own needs well, why would we think they would meet another's?" (Wiley, 2003).

The requirement for use for learning has also come out of our experience in this and many other projects that evaluation with students should start as early as possible, if not right at the outset. The earlier evaluation with real users begins, the more likely the outputs of the project are to be used in learning. If we want to start creating learning objects that will be used in learning, we need to evaluate them even before they hit the drawing board.

There is one further point to make. The definition does not say who uses the learning object for learning or that there is a requirement for the learning outcome to match the learning goal intended in developing the learning object. It is possible to develop a learning object with a specific learning goal in mind, and once in the hands of a learner, for the same learning object to meet an entirely different goal. By definition, *when this occurs the learning object has become a new learning object*. Ensuring that goals match outcomes comes from the skill of the learning object designers. Ensuring that in some cases goals don't match intended outcomes comes from the infinite variety and skill of the learners themselves.

In a sense, the learning object can be thought of as a ball, constantly changing shape, form and colour as it passes between the hands of learners, teachers and learning object designers, each pass resulting in a new learning object as each individual applies their own rules to the ball.

It is important when thinking about this analogy to remember that the learning object is not equivalent to a digital object or even to a physical object. The learning object is constructed from simpler learning objects by the application of rules for meaning activity or purpose. It is therefore feasible for parts of any given learning object to reside in a number of places at once: for example, in digital storage, in a learner's head, and in a teacher's hands.

Learning object properties

Does the proposed definition support the existing generally agreed properties of learning objects? The properties addressed here are: Reusable, accessible, interoperable/portable, and durable (Rehak & Mason, 2003). To examine each in turn:

- **Reusable:** By the proposed definition a learning object *must* be reusable.
- **Accessible:** The definition says nothing about accessibility *per se* but it implies that learning objects *should* be accessible if they are to be reused.
- **Interoperable:** The definition says nothing about interoperability *per se* but again if a learning object is to be reusable it *should* operate on a variety of hardware and software platforms.
- **Durable:** Since the definition is not concerned with specifying hardware or software the learning object *must* be independent of hardware and software changes but whether it persists in a particular digital state is another matter.

The new definition establishes *a priori* that learning objects are reusable, can be of any size and must be used for learning.

While accessibility, interoperability and durability may be properties of some learning objects they are not defining properties of all learning objects. So for example, in the case of the information literacy project, the project team agreed that the information literacy modules must be:

- easily accessible via the Web
- available to be used either online or downloaded for use offline
- able to work in a SCORM 1.2 run-time environment
- look and function the same way on all common browsers and computer platforms
- they must be conform to XHTML/CSS standards for Web delivery
- modules must be able to be easily edited/re-contextualised by non-technical users and the new edited modules saved and made available for anyone else to use.

The learning objects themselves did not determine any of these properties, we did. We established these properties as we negotiated the goals of the project. For example, we had made a decision to work with the SCORM early in the project but we soon discovered we could not work exclusively with the SCORM if our modules were to have the properties listed above. To illustrate this point, Table 2 assesses SCORM against our properties and notes some additional key issues.

Testing the definition against the information literacy modules

Do the five information literacy modules produced thus far meet the proposed definition of a learning object?

Each module is the result of a process by which we defined the rules for the construction of a learning object and then applied them to construct new learning objects. At the most fundamental level every time a member of the project team wrote a phrase or a sentence they were in effect constructing a learning object by applying the rules of English grammar to words, for meaning, activity or purpose. New rules were applied when we combined the resulting text with images, audio, video or animations and when it came to ordering and organising these collections of digital media. In the process of constructing meaning, activity or purpose in this way, we were using the learning objects for our own learning. At several points in the development process we also made materials available for others, including students, outside the project team to use. We have formally evaluated one completed module, Essay writing with Readings, with students in the course for which it was originally designed. In addition this module has been evaluated with students from each institution for whom it was not specifically designed, but for whom the module was likely to have some relevance. The results of this evaluation support the requirement in the definition that the module is used for learning (Keen et al., 2006).

On the face of it, at least one module meets the proposed definition. Provided we evaluate the remaining completed modules with students and can demonstrate that these have been used for learning, we would expect them to meet the definition also.

Nonetheless, ‘used for learning’ raises a number of questions that are worth further investigation but are beyond the scope of this paper. Is a learning object still a learning object if it is not currently being used for learning? Is there a place for the idea of strong or weak learning objects based on the number of people who use a learning object? Is frequency of use important?

Comparison with existing learning object definitions

How does the proposed definition compare with existing definitions? Does it really take us any further ahead?

The definition of a learning object is complex. Teachers, software designers, researchers and media producers, amongst others, have tried to turn the learning object concept into a reality (Haughey &

Muirhead, 2005). Although not referring directly to learning objects, Laurillard (2001) has already pointed out that:

> The development of educational media has an odd mix of engines driving it, technological pull, commercial empire building, financial drag, logistical imperatives, pedagogical pleas, and between them they generate a strange assortment of equipment and systems from which the educational technologist must fashion something academically respectable" (p.83).

Table 2: Information literacy module 'rules' compared with the SCORM

Properties for information literacy modules	**SCORM**
Easily accessible via the Web	Yes, provided that a SCORM compliant player is available to run the module. The SCORM compliant player or run-time environment (RTE) must support the version of SCORM for which the SCORM package was created. For example, SCORM 1.2 packages will not run in a SCORM 2004 RTE without some modification.
Available to be used either online or downloaded for use offline	In principle, SCORM packages can be used online or offline but in practice this would require end users to have a SCORM RTE on their offline computer system
Able to work in a SCORM 1.2 run-time environment	Yes.
Look and function the same way on all common browsers and computer platforms	A package may be SCORM compliant but still look and even function differently on different browsers.
They must conform to XHTML/CSS standards for Web delivery.	Being Web-based is a foundation SCORM concept (ADL, 2004). It is left up to developers to follow good design principles including separating web page data from the presentation of that data.
Modules must be able to be easily edited/re-contextualised and the new edited modules saved and made available for anyone else to use.	This is beyond the scope of SCORM in terms of being able to edit at the level of, for example, text within an individual Shareable Content Object (SCO) or Resource. Provided a SCO or resource is not in a proprietary format or protected in some way, there is nothing preventing someone with sufficient technical knowledge from editing an individual SCO or Resource. This does however move away from our requirement that editing and re-contextualisation should be easy for non-technical users.
Some additional practical SCORM issues	
RTE availability and stability: We were unable to source a freely available SCORM 2004 RTE robust enough for evaluating modules with students. At the time of writing, even though all collaborating institutions use the same LMS, only the University had the SCORM 1.2 RTE setup and this was only available in a development server environment. This really dictated our decision to stick with SCORM 1.2 and meant that simple sequencing features of SCORM 2004 were not an option for this project.	
Data handling: A key feature of SCORM is the ability to exchange data with an LMS. There may be constraints within an LMS itself in terms of what and how data is saved. We found the time taken to work around these issues far exceeded the likely benefit of implementing the data handling features we wanted *in the context of this project.*	
The glossary problem: This has been identified by others (Wirski, Brownfield and Oliver, 2004) for SCORM 1.2. There are workarounds but these are not entirely satisfactory for all situations.	
Packaging: By the time glossary-type features, communication with LMS and stability concerns had been addressed (by deletion), our SCORM packages offered no discernible advantage over IMS Content packaging. That said, the SCORM 1.2 packages we created did comply with SCORM 1.2. This was verified by both external review and testing with the ADL test-suite. In addition the packages displayed correctly in several SCORM RTEs and were easily disaggregated using a suitable package editor.	

The same ‘odd mix of engines’ drive learning objects today. The following are two definitions of learning objects from Rehak and Mason (2003):

> A digitised entity which can be used, reused or referenced during technology supported learning (p.21).
>
> A small chunk of learning which serves a learning objective (p.21).

Here is a definition from the Institute of Electrical and Electronic Engineers (IEEE), Learning Technology Standards Committee (IEEE LTSC, 2002):

> Any entity, digital or non-digital, that may be used for learning, education or training.

Kay and Knaack (2005) provide a useful review of many definitions and suggest that definitions are either technology focussed or learning focussed. They redefine learning objects using components from both learning and technical definitions:

> reusable, interactive web-based tools that support the learning of specific concepts by enhancing, amplifying, and guiding the cognitive processes of learners (p.231).

And finally a description from Wiley (2001):

> Any digital resource that can be reused to support learning (p.7).

As Rehak and Mason point out, ideas about what a learning object is can range from just about anything (e.g., IEEE) to something requiring specific objectives and assessment (Rehak & Mason, 2003).

What none of these definitions provide is any sense of the internal structure of the learning object. The learning object has always been viewed, not surprisingly perhaps, from an object-centric perspective; it is simply an object with some properties.

What sets the proposed definition apart is that it provides a coherent description of the internal structure of a learning object. The defining property of reuse is a logical consequence of its recursive structure. The proposed definition also directly challenges notions of granularity and learning object size. If we accept the proposed definition, then we accept that the inherent size of a learning object is of no consequence in order for it to be a learning object. The proposed definition also demands that in order for a learning object to be a learning object, it must be used for learning.

From this position then, does the proposed definition resolve the key problem highlighted in this paper: the tension between technical reusability and pedagogical coherence? If it does, is it possible to chart a new course for learning objects?

An argument for change

I have claimed, by using a recursive definition, that learning objects are reusable. From this follows the possibility for infinite variety in terms of how a learning object is constructed and used by teaching staff and students. So the answer to the question of whether the new definition resolves the tension between technical reusability and pedagogical coherence is an unequivocal yes. If this is the case, why have so many of us been struggling with learning objects? I think the answer to this lies in the imprecise way we have been using the word reusability and the merging of technical and pedagogical rules that we use to construct learning objects.

Software and systems designers look at reusability from a technical perspective: “The design must ensure that I can unplug a learning object from your system and plug it into straight mine without any tweaking or fiddling”. Teachers and educational designers look at reusability from a pedagogical perspective: “I can take a learning object that you have created and use it for my students. I accept that I may need to tweak or fiddle with it in order to fit my context. Indeed, I must be able to do this because I have an infinite variety of students to work with”.

My contention is that the recursive definition of learning object is implicit in the non-deterministic way that teachers, educators, and students operate. By contrast, for software and systems designers and developers, and paradoxically it seems for many in the educational technology field, the object-centric or software engineering view of learning objects predominates. The object-centric view addresses reusability from a necessarily deterministic perspective.

If we can accept that a learning object is recursive by nature we can embark on an agenda of designing software, services and systems which make it easy for teachers and learners to tweak, fiddle and apply their own rules to construct new learning objects for meaning, activity or purpose.

In summary, the new definition affords the following benefits:

- It allows for an infinite variety of meaning, activity and purpose in the education setting. It does not preclude or mitigate against the use of any educational strategy or combination of strategies to develop a learning object.
- It provides a new way of thinking about learning objects that closely parallels how teachers and students actually construct meaning, activity and purpose whether in the digital domain or not.
- It makes explicit the structure of learning objects that is absent from existing definitions and aids understanding of both the learning object and the development process.
- It does away with the confounding problems of size and granularity and directly challenges the object-centric view of learning objects. Both these features have fuelled debate and our experience has been that they have rendered learning objects largely useless as a practical concept in a Higher Education environment. This supports the view of Fill and co-workers (Fill, Leung, DiBiase & Nelson, 2006).
- There is infinite scope within the definition for rules to be applied which restrict a given learning object's domain. So for example someone who says that their learning objects have to have clear educational outcomes and some form of assessment can specify this in the finite rules for construction of the learning object. What they cannot specify is that the domain will remain restricted in the hands of their students!
- It does not preclude the work going on in the specifications and standards field. For example, the Essay Writing with Readings module from the information literacy project meets the new definition, and it is also available as a SCORM 1.2 compliant package for those who want to use the SCORM.
- It demonstrates that software, systems and services used in the construction of learning objects should support the goals students and teachers have in developing learning objects. The concept that somehow we should be mapping pedagogical principles to learning objects in order that they will 'plug and play' is anathema.

References

Advanced Distributed Learning, (2004). *SCORM 2004 Overvie*w. http://adlnet.org/scorm/history/2004/documents.cfm [2nd edition viewed 20 June 2006].

Boehm, B. (1988). A Spiral Model of Software Development and Enhancement. *Computer*, 21(5), 61–72

Boyle, T. (2003). Design principles for authoring dynamic, reusable learning objects. *Australian Journal of Educational Technology,* 19(1), 46–58.

Campbell, L. (2003). Engaging with the learning object economy. In A. Littlejohn (Ed), *Reusing Online Resources. A Sustainable Approach to e-Learning*. London: Kogan Page.

Fasold, R. & Connor-Linton, J. (2006). *An Introduction to Language and Linguistics*. Cambridge: Cambridge University Press.

Fill, K., Leung, S., DiBiase, D. & Nelson, A. (2006). Repurposing a learning activity on academic integrity: the experience of three universities. *Journal of Interactive Media in Education.* JIME pre-print: http://jime.open.ac.uk/2006/01 [viewed 20 June 2006].

Godel, K. (1931). *On formally undecidable propositions of Principia Mathematica and related systems I*

Haughey, M. & Muirhead, B. (2005). The pedagogical and multimedia designs of learning objects for schools. *Australian Journal of Educational Technology,* 21(4), 470–490.

Hegarty, B. Coburn, D., McDonald, J. & Cone, T. (2006). Overview Evaluation Report. eCDF Project 423 Information Literacy eLearning Modules Reusableand portable across a College of Education, a Polytechnic and a University. http://oil.otago.ac.nz/oil/index/Resources-and-materials/eCDFGeneralEvaluationReportFinal.pdf [viewed 24 Jun 2006]

Hofstadter, D. (1979). *Godel, Escher, Bach*. Hassocks, Sussex: The Harvester Press.
IEEE Learning Technology Standards Committee (2002). Learning Object Metadata, WG12 http://ieeeltsc.org/wg12LOM/lomDescription [viewed 31 July 2006].
Kay, R. & Knaack, L. (2005). Developing Learning Objects for Secondary School Students: A Multi-Component Model. *Interdisciplinary Journal of Knowledge and Learning Objects*, 1(1), 229–254.
Keen, D., Ritson-Jones, W., Coburn, D., Hegarty, B. & McDonald, J. (2006). Real Use Research Evaluation Report for Module One – Essay Writing: eCDF 423 Information Literacy eLearning Modules Project. http://oil.otago.ac.nz/oil/index/Resources-and-materials/eCDF423RealUseResearchReportFinal.pdf [viewed 24 Jun 2006].
Laurillard, D. (2002). *Rethinking University Teaching. A Conversational Framework for the Effective Use of Learning Technologies*. 2nd edn, London : RoutledgeFalmer.
Littlejohn, A. (Ed), (2003). *Reusing Online Resources. A sustainable Approach to e-Learning*. London: Kogan Page.
Martin, J. (1991). *Rapid Application Development*. Indianapolis, IN, USA: Macmillan Publishing Co., Inc.
Rehak, D. & Mason, R. (2003). Keeping the learning in learning objects. In A. Littlejohn (Ed), *Reusing Online Resources. A sustainable Approach to e-Learning*. London: Kogan Page.
Snyder, C. (2003). *Paper Prototyping: the fast and easy way to design and refine user interfaces*. San Francisco, California: Morgan Kaufmann.
Turing, A. (1936). On Computable Numbers, With an Application to the Entscheidungsproblem, *Proceedings of the London Mathematical Society*, Series 2, Volume 42.
van Merriënboer, J. J. G., Clark, R. E., & De Croock, M. B. M. (2002). Blueprints for complex learning: The 4C/ID-model. *Educational Technology, Research and Development*, 50(2), 39–64.
Wiley, D. (2001). Connecting Learning objects to instructional design theory: A definition, a metaphor and a taxonomy. In D. Wiley (Ed), *The Instructional Use of Learning Objects*. http://www.reusability.org/read/ [viewed 12 Jun 2006].
Wiley, D. (2003). Introduction to Part 2. In A. Littlejohn (Ed), *Reusing Online Resources. A sustainable Approach to e-Learning*. Kogan Page.
Wiley, D. (2006). RIP-ping on learning objects. http://opencontent.org/blog/archives/230 [viewed 20 June 2006].
Wirski, R., Brownfield, G. & Oliver, R. (2004). Exploring SCORM and the national flexible learning toolboxes. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds), Beyond the comfort zone: *Proceedings of the 21st ASCILITE Conference* (pp.938–947). Perth, 5–8 December. http://www.ascilite.org.au/conferences/perth04/procs/wirski.html [viewed 4 June 2006].

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