



UniServe Science

Reading Supplements for

Symposium: Science Teaching and Learning Research
including Threshold Concepts

September 27 & 28, 2007
The University of Sydney



UniServe Science has compiled this bibliography on assessment in science teaching and learning from the Web and the following journals:

- AJET: Australian Journal of Educational Technology
- Bioscience Education E-journal
- British Journal of Educational Technology
- Planet
- Teaching Learning Forum: Proceedings

References that relate to research in university science education and assessment published between 2006 and 2007

Bibliographies prepared for previous UniServe Science Conferences are available online from
<http://science.uniserve.edu.au/workshop/>

This document supplements other material provided at the UniServe Science Symposium: *Science Teaching and Learning Research including Threshold Concepts*, held at The University of Sydney, September 27 & 28, 2007.

UniServe Science is funded by The University of Sydney through the Faculty of Science.



Boustedt, J., Eckerdal, A., McCartney, R., Mostrom, J., Ratcliffe, M., Sanders, K. and Zander, C. (2007) Threshold concepts in computer science: do they exist and are they useful? *ACM SIGCSE Bulletin* (39)1, 504 – 508.
<http://portal.acm.org/citation.cfm?id=1227504.1227482>

Yes, and Yes. We are currently undertaking an empirical investigation of 'Threshold Concepts' in Computer Science, with input from both instructors and students. We have found good empirical evidence that at least two concepts—Object-oriented programming and pointers—are Threshold Concepts, and that there are potentially many more others. In this paper, we present results gathered using various experimental techniques, and discuss how Threshold Concepts can affect the learning process.

Bradbeer, J. (2005) Threshold concepts and troublesome knowledge in the GEES disciplines, *Planet*, (15)3
<http://www.gees.ac.uk/planet/p15/jb.pdf>.

Abstract not available

Carstensen, A-K., Holmberg, M. and Bernhard, J. (2006) *Threshold Concepts and Key Concepts in Electrical Engineering Education*. Paper presented at 4th CeTUSS Workshop: Perspectives on use of Technology in Engineering Education, Uppsala, December 4-5, 2006.
http://staffwww.itn.liu.se/~jonbe/fou/didaktik/papers/Carstensen_Cetuss06.pdf

Research in science education has for a long time dealt with students' views of single concepts, although one of the common objectives in physics and engineering education is 'to learn relationships'. The research on threshold concepts is dealing with concepts that are related, and is thus opening up a new dimension of the research on understanding. In our own research we have been investigating what we call complex concepts, i.e. concepts that make up a holistic system of 'single' interrelated concepts.

In the field of electrical circuits, there has been extensive research on student understanding of direct current (DC) circuits among pre-university students, but hardly any research on alternating current (AC) circuits and engineering students understanding. Confusion of concepts such as current, voltage, power and energy and local and sequential reasoning is reported. One possible reason for these concepts to be troublesome could be that they are highly interdependent, and can thus possibly not be understood one by one, but have to form an integrated whole.

What then constitutes a threshold concept? How can we find them? And how can we possibly find a way to teach so that thresholds are crossed?

Carstensen, A-K. and Bernhard, J. (2006) Threshold Concepts and Key Concepts – Some examples from Electrical Engineering
http://www.hkr.se/upload/MNA/doc/FontD_Carstensen_Bernhard.pdf

The research in Science education has for a long time dealt with misconceptions of single concepts, although one of the common objectives in physics is 'to learn relationships'. The research on threshold concepts is dealing with concepts that are related, and is thus opening up a new dimension of the research on understanding. In our own research we have been dealing with what we call complex concepts, i.e. concepts that make up a holistic system of 'single' interrelated concepts. In the field of electrical circuits, there has been a lot of research on the understanding of direct current (DC) circuits among pre-university students, but hardly any research on alternating current (AC) circuits. Confusion of concepts such as current, voltage, power and energy is reported. One possible reason for these concepts to be troublesome could be that they are highly interdependent, and can thus possibly not be understood one by one, but have to form an integrated whole.

How then does this relate to the research on threshold concepts? How can we recognize threshold concepts? And how can we possibly find a way to teach so that thresholds are crossed?

Our proposal in this paper is to distinguish between ways to identify threshold concepts and ways to identify what needs to be addressed in order to open up learning spaces. We propose the term 'key concepts' for those concepts that open up the 'portal'.

We try to explore how a threshold concept may become identified, how we by studying video recordings from labwork propose a way to see what is troublesome within the concept, how the use of variation theory can open up new dimensions in the learning space, thus finding keys to open up the 'portal', and how, again by video transcripts, we can evaluate the new learning sequence.

Cope, C. (2006) Improving Student Learning Through Teaching: Improving teaching about threshold concepts. In *Threshold Concepts within the Disciplines Symposium*. <http://www.brookes.ac.uk/services/ocsls/isl/isl2006/papers/session2/cope.html>

The notion of threshold concepts is a relatively new one in the student learning research literature. A threshold concept has been described by Meyer and Land (2005) as a portal, opening up a new and previously inaccessible way of thinking about something. A key feature of threshold concepts is that they are troublesome for students. It follows that teaching about threshold concepts could be improved. While the literature describes the nature of threshold concepts in detail it does not report research-based projects which have successfully improved teaching. This paper describes a project which successfully identified and implemented more appropriate approaches to teaching about information systems (IS), a threshold concept in the IS discipline. While a threshold concept specific to one discipline was the focus of the research, the paper describes a research approach which can be used to identify and evaluate more effective teaching approaches for any threshold concepts.



Cousin, G. (2006) An introduction to threshold concepts. *Planet*, **15**,
<http://www.gees.ac.uk/planet/p17/gc.pdf>

The idea of threshold concepts emerged from a UK national research project into the possible characteristics of strong teaching and learning environments in the disciplines for undergraduate education (Enhancing Teaching-Learning Environments in Undergraduate Courses - <http://www.tlrp.org>). In pursuing this research in the field of economics, it became clear to Erik Meyer and Ray Land (2003, 2005, 2006), that certain concepts were held by economists to be central to the mastery of their subject. These concepts, Meyer and Land argued, could be described as 'threshold' ones because they have certain features in common. The purpose of this brief piece is to outline these features and to point to the distinctive value of a threshold concept approach for curriculum design.

Davies, P. (2005) Threshold Concepts: how can we recognise them? Working Paper, Staffordshire University
[http://www.staffs.ac.uk/schools/business/iepr/info/Economics\(2\).html](http://www.staffs.ac.uk/schools/business/iepr/info/Economics(2).html)

A threshold concept is defined by Meyer and Land (2003) as possessing the following qualities: transformative, integrative, bounded, and probably irreversible. This concept provides a promising way of interpreting the learning demand presented by subjects and Meyer and Land have begun to apply the idea in analysing learning economics. It redefines the familiar idea of a 'powerful concept' in a social constructivist context, providing a penetrating tool for the analysis of the development of discipline specific learning. This paper examines some difficulties to be faced in the operationalisation of the idea of 'threshold concepts' in economics and, in so doing, begins to identify ways in which these problems might be overcome.

Davies, P. and Mangan, J. (2005) *Recognising Threshold Concepts: an exploration of different approaches*, Working Paper, Staffordshire University
[http://www.staffs.ac.uk/schools/business/iepr/info/Economics\(2\).html](http://www.staffs.ac.uk/schools/business/iepr/info/Economics(2).html)

This working paper briefly reviews the idea of 'Threshold Concepts' and considers the application of this to the progress of learning in economics. We suggest that a distinction between basic, threshold discipline and modelling concepts may be useful in determining a framework for the identification of threshold concepts in economics. We argue that it may be appropriate to think in terms of a web of threshold concepts within the subject. A range of evidence is presented to illustrate the existence and implications of threshold concepts in economics.

Davies, P. and Mangan, J. (2005) *Embedding Threshold Concepts: from theory to pedagogical principles to learning activities*, Working Paper, Staffordshire University
[http://www.staffs.ac.uk/schools/business/iepr/info/Economics\(2\).html](http://www.staffs.ac.uk/schools/business/iepr/info/Economics(2).html)

In this paper we develop an account of the problems confronting learners by blending insights from threshold concepts and variation theory. In particular, we use both of these ideas to develop a coherent account of the structure of understanding and the implications for learning in the disciplines. On this basis we propose four pedagogic principles and describe three types of activity that seek to operationalise these principles. We report briefly on experience in using these activities in a project 'embedding threshold concepts in first-year undergraduate economics' in four universities in England. We comment on some implications of this experience.

Davies, P. and Mangan, J. (2005) Trajectories of students' learning: threshold concepts and subject learning careers, Working Paper, Staffordshire University
[http://www.staffs.ac.uk/schools/business/iepr/info/Economics\(2\).html](http://www.staffs.ac.uk/schools/business/iepr/info/Economics(2).html)

Threshold concepts provide a fruitful way of revisiting the notion of 'learning careers' (Bloomer and Hodkinson, 2000; Bloomer, 2001) in the context of students' acquisition of the ways of thinking and practising of a particular discipline (McCune and Hounsell, 2005). Most students in Higher Education are following courses of study that induct them into the practices of a particular discipline, field or profession. The social context of their learning is framed by their experience of the particular academic community with which they are engaging. They are 'learning biology' or 'learning to nurse'. Threshold concepts (Meyer and Land, 2005) offer a helpful way of characterising the trajectories of students' experience of learning in these contexts.

Meyer and Land (2005) suggest that within each discipline, field or profession there are threshold concepts which integrate and define the scope of the academic community with which a student is engaging. We suggest that students' progress towards a deepening engagement with these communities: (1) the early stages of a subject learning career involve the acquisition of 'building blocks' which at that stage cannot be understood in the way that a master of the subject would understand them, because the learner has not yet acquired the relevant threshold concepts; (2) as students become aware of threshold concepts they face a major stage in their subject learning career, since acquisition of a threshold concept will help students to integrate and reinterpret their previous learning; (3) as students meet further threshold concepts these in turn may transform their understanding of threshold concepts they have previously acquired. Students' responses to these different aspects of their subject learning career may have profound implications for their progress and achievement.



Dunne, T., Low, T., and Ardington, C. (2003) *Exploring Threshold concepts in basic Statistics, using the Internet*. <http://www.stat.auckland.ac.nz/~iase/publications/6/Dunne.pdf>

Meyer and Land (2002) have introduced the notion of a threshold concept in student learning. By definition a threshold is an insight which is initially alien or counter-intuitive, is integrative in that it subsumes some previous knowledge and is transformative in that it leads to a different perspective of or within the discipline.

The notion is suggested to be applicable in many disciplines. It is phrased in terms that the threshold nature of a concept is defined mainly by the student experience rather than simply an objective analytical process.

Nonetheless past experience may lead teachers of statistics at tertiary level to surmise that threshold concepts in basic statistics will include the notion of patterns of spread or variation, randomness, sampling, the central limit theorem, and linear regression. Introductions to Bayes' theorem and interval estimation are further candidates. Hypothesis testing may present other difficulties. Some methods and results in an exploration of student perspectives will be presented.

A class of over 465 students in their second semester course of undergraduate applied statistics (STA220) participated in a survey with a short list of 4 items via internet and PC lab access to a WebCT site supporting their current course. The 4 items addressed their experience in the earlier course (STA100), and were as follows:

Explain in your own words the term random sample.

The central limit theorem tells us something about the mean of a sample. State in your own words what the theorem implies.

List three concepts you found very simple to learn about in STA100.

List the three most difficult concepts that you learnt about in STA100.

The motive for the exploration is the open question of whether or not two key concepts were clearly and articulately reported by the respondents, and whether there is initial supportive evidence for any particular concepts being experienced as threshold concepts by these students.

As teaching effort aimed at plausible threshold concepts may lead to more successful student participation and learning, the diagnostic value of an internet resource that assists in collection of data may be substantial. Text editors may assist in the analysis of typed responses. Internet connections will allow for the quicker transfer of data and for rapid interchange of improved public domain material addressing concepts that appear to have threshold qualities.

Eckerdal, A., McCartney, R., Mostrom, J.E., Ratcliffe, M., Sanders, K. and Zander, C. (2006) Putting threshold concepts into context in computer science education. In *ACM SIGCSE Bulletin*, (38)3, 103–107.

<http://portal.acm.org/citation.cfm?id=1140123.1140154>

<http://www.it.uu.se/research/group/upcerg/files/EckerdalPuttingThresholdconcepts.pdf>

This paper describes Threshold Concepts, a theory of learning that distinguishes core concepts whose characteristics can make them troublesome in learning. With an eye to applying this theory in computer science, we consider this notion in the context of related topics in computer science education.

Meyer, J. and Land, R. (2003) *Threshold Concepts and Troublesome Knowledge: Linkages to Ways of Thinking and Practising within the Disciplines*. <http://www.tla.ed.ac.uk/etl/docs/ETLreport4.pdf>

This report arises from ongoing research undertaken by the Economics team of the Economic and Social Research Council's Teaching and Learning Research Programme Project 'Enhancing Teaching and Learning Environments in Undergraduate Courses' (ETL). The Project forms part of Phase II of the Programme. The ETL Project is seeking to identify factors leading to high quality learning environments within five disciplinary contexts across a range of higher education institutions. Meyer's notion of a threshold concept was introduced into project discussions on learning outcomes as a particular basis for differentiating between core learning outcomes that represent 'seeing things in a new way' and those that do not. A threshold concept is thus seen as something distinct within what university teachers would typically describe as 'core concepts'. Furthermore, threshold concepts may represent, or lead to, what Perkins (1999) describes as troublesome knowledge – knowledge that is conceptually difficult, counter-intuitive or 'alien'. Drawing both on project interviews and on observations contributed by academic colleagues from a range of disciplines, the report attempts to define characteristics of threshold concepts and, in the light of Perkins' work, to indicate correspondences between the notion of threshold concepts and that of troublesome knowledge.

Meyer, J. and Land, R. (2005) Threshold concepts and troublesome knowledge (2): Epistemological considerations and a conceptual framework for teaching and learning, *Higher Education*, (49)3.

<http://www.springerlink.com/content/q302w85n8217185k/>

The present study builds on earlier work by Meyer and Land (2003) which introduced the generative notion of threshold concepts within (and across) disciplines, in the sense of transforming the internal view of subject matter or part thereof. In this earlier work such concepts were further linked to forms of knowledge that are 'troublesome', after the work of Perkins (1999). It was argued that these twinned sets of ideas may define critical moments of irreversible conceptual transformation in the educational experiences of learners, and their teachers. The present study aims (a) to examine the extent to which such phenomena can be located within personal understandings of discipline-specific epistemological discourses, (b) to develop more extensively notions of liminality within learning that were raised in the first paper, and (c) to propose a conceptual framework within which teachers may advance their own reflective practice.



Threshold Concepts in GEES: ideas from conference participants 26 June 2006. (2007) *Planet*, **15**.
<http://www.gees.ac.uk/planet/p17/tcideas.pdf>

Abstract not available

Truscott, J., Boyle, A., Burkill, S., Libarkin, J. and Lonsdale, J. (2006) The concept of time: can it be fully realised and taught? *Planet*, (**17**) 21-23.
<http://www.gees.ac.uk/planet/p17/jt.pdf>

This article discusses the threshold concept of 'time' in relation to student teaching and learning within the GEES subjects. Preconception and sensory perception of the world is thought to play a key role in how students develop their ideas of 'time' in relation to their experiences, be it from non-academic life, classroom based learning or fieldwork. Geological time or 'deep time' is a clear example of the problems that students have in conceptualising time in contexts that do not relate to everyday situations. Combining complex terminology with the introduction of new concepts can further hinder the student's proper understanding, for example, the concepts of radiometric-dating, absolute and relative time can create a mire of confusion. One possible solution is to revisit the expert's own past learning experiences of such concepts as a means to bridging the barriers of knowledge transfer from teacher to student - the so called 'aha!' moments. Such insights could lead to the development of innovative teaching materials that overcome the problems. Applying properly supported analogies, either in fieldwork or the classroom, can result in effective teaching approaches. However, we should always remain vigilant that student preconceived ideas and perceptions may inhibit proper understanding and learning progression.



Abbott, L., Mcfarlane, J., and Pluske, J. (2007) Introducing 'deep learning' concepts to first year university students for integrating teaching of terrestrial ecosystems, *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

The overall purpose of this study was to introduce 'deep learning' concepts to first year students within the framework of understanding terrestrial ecosystems. The unit is taught by staff from different disciplines and this had led to discontinuity in presentation of information and explanation of concepts. We introduced the SOLO (Structure of the Observed Learning Outcomes) Taxonomy developed by Biggs to students at their first lecture. Students were encouraged to interpret the five levels of learning in their own words on several occasions. During the last three weeks of semester, students assessed each other's work and estimated the level of learning shown in the exercise. Most students were able to interpret and describe the meaning of the five SOLO Taxonomy levels at their first attempt. Many students were able to estimate the level of learning exhibited by their peers, and expressed some understanding about how to deepen their learning, but others were not confident about which level they themselves were at. Introducing the SOLO Taxonomy concept confused several students and angered a few others. Concepts of 'deep learning' were integrated moderately successfully but received unexpected and mixed reactions from the students. However, this process was useful for the staff teaching in the unit because it encouraged them to think about the unit as a whole as well and to consider how to better integrate each section to give students the opportunity to learn at different levels.

Allison, G.T. (2007) Do students prefer online learning module compared with a hard copy version? *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

Student feedback on innovation in courses is limited by their experience. Many aspects influence their perception of the quality of the teaching, the content and the environment. Few studies have examined student preference and staff workload running parallel hard copy and online versions of identical course content.

An external unit Masters degree in Physiotherapy was duplicated using WebCT. Students enrolled in the external unit were offered the option of participating in the online version or the hard copy version or a combination. The online version had practice quizzes for immediate feedback on performance (no marks allocated) and then a proportion of online responses which contributed to their semester mark. They then submitted a subsection of essay questions that the hard copy requirements. An independent examiner scored the written answers which were common to both units.

Students had experienced both versions to some extent. They were asked to compare the two systems on the learning experience, workload, convenience and overall preference. Their duration of activity and number of times that they entered each quiz in WebCT was logged. Their overall preferences and workloads were compared to students who used only the hardcopy version. Staff were also asked to compare the workload of both - ignoring set up time. The initial results suggest that the students utilise the online learning model as an additional resource. They use the practice quizzes as an interactive learning experience. This is popular. Yet they prefer to provide extensive answers in the written form to be independently assessed. Flexible delivery options are restricted by inflexible administrative protocols suited to on campus delivery.

The study will be completed by end of semester II 2007 and comparative analyses on learning outcomes and preferences are being collated.

Annett, G. (2007) Podcasting in education. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

Many educators and institutions are already integrating podcasting successfully into their curricula - with great results. Podcasting enables educators to use music and recorded audio to enhance learning. The addition of photos and video to podcasting allows educators to add a wide range of visual content to their teaching and address even more learning styles.

Podcasting is a powerful tool that allows for communication and distribution of educational content - content that can be synced to iPod for learning on the go. Podcasting is also an inexpensive way for schools and higher education institutions to share information.

This presentation will emphasise the following.

- What is podcasting?
- What are the tools available for podcasting?
- How to incorporate podcasting into teaching and learning
- Illustrative examples of university departments using podcasting

Barnett, J. (2006) Implementation of personal response units in very large lecture classes: Student perceptions. *Australasian Journal of Educational Technology*, **22**(4), 474-494.

This article reports on a large scale implementation of personal response units in three introductory science courses at the University of Western Ontario in Canada. An online survey of students was conducted to gather their perceptions on the uses of the devices, triangulated by participant observation of the classes and email interviews with the instructors. Although the students' perceptions were generally favourable, problems associated with implementation were widespread. Advantages and disadvantages of the technology are discussed along with suggestions for its use.



Bartle, E. and Cook, J. (2007) Attitudes of tertiary students towards a group project in a science unit. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

A key factor sought by industry when hiring scientists is their ability to work as part of a team. It is essential that scientists are able to work in collaboration with a diverse range of people across multidisciplinary fields, both within their organisation and the wider community. Literature indicates that the incorporation of group based assessments within tertiary teaching provides opportunity for the development of interpersonal and communication skills, skills most important to a scientist's employability, productivity and career success.

This study considered the effectiveness of group work based assessments at a tertiary level. Two populations of students enrolled in different units were considered. First year viticulture students enrolled in a chemistry unit were required to produce an information poster on a chosen science topic, demonstrating understanding of the associated chemistry, appropriate use of diagrams and equations, showing links between concepts and ensuring visual appeal. Students enrolled in a science communication unit were required to produce a short iMovie on a chosen science topic, with the emphasis on communicating scientific concepts to a general audience within a given time frame. These are all essential skills for scientists in the workplace.

The students were surveyed to ascertain their feelings about a collaborative learning assessment task. Using a scale of agreement, they were asked to provide information on their level of interest in the project, their thoughts on working within a group, strategies used by their group to complete the task, challenges completing the assignment, information learned through collaborative learning, group dynamics and suggestions for change, and whether they thought overall that additional interpersonal and communication skills learned during the collaborative learning were of use and importance. Focus group interviews were also conducted with selected students. Data collected was analysed to examine the different processes related to group work and draw overall conclusions about the effectiveness of this type of assessment for tertiary students.

Baser, M. (2006) Promoting conceptual change through active learning using open source software for physics simulations. *Australasian Journal of Educational Technology*, **22**(3), 336–354.

This paper reports upon an active learning approach that promotes conceptual change when studying direct current electricity circuits, using free open source software, Qucs. The study involved a total of 102 prospective mathematics teacher students. Prior to instruction, students' understanding of direct current electricity was determined by a subset of a previously developed multiple choice conceptual test. All students received an active learning instruction using Qucs simulations. After instruction, the same test was administered to the students to determine the effectiveness of the instruction they received. Paired t-test analyses showed that students' progress on understanding of direct current electricity was significant. A six week delayed post-test revealed that this observed improvement promised to be durable, at least in the short term. Students' evaluation of using Qucs is also reported.

Benson, R. and Palaskas, T. (2006) Introducing a new learning management system: An institutional case study. *Australasian Journal of Educational Technology*, **22**(4), 548–567.

The introduction of an online learning management system (LMS) raises a number of complex issues involving institutional responses at various levels to the adoption and diffusion of technological change. Issues include those related to governance, management and technical support, as well as to core learning and teaching matters associated with the professional development and teaching of academic staff, and the support of staff and students. This paper draws on two cycles of an evaluation conducted in one institution as WebCT Vista was introduced and piloted, highlighting the key issues that emerged from the evaluation. These issues are considered in the context of a selected model for examining the adoption and diffusion of information and communication technologies (ICTs) in higher education, with a view to analysing the outcomes of the initiative, and guiding future planning.

Bowes, K. and Marker, E. (2006) Assessing technology integration: Its validity and value for classroom practice and teacher accountability. *Australasian Journal of Educational Technology*, **22**(4), 439–454.

This article questions whether popular approaches to the assessment of technology integration with classroom instruction are valid. The article explores Messick's (1993) conceptualisation of consequential validity, in an attempt to understand what validity must be evident when the integration of technology with classroom instruction is assessed. This article also compares and contrasts assessment tools and systems that are currently used, searching for evidence of valid assessment. Individually these tools sample a very limited collection of teacher knowledge and skill. Against a backdrop of rapidly expanding expectations and rapid change, the tests are probably unable to capture what teachers need to do, and more importantly what they actually are doing. The article concludes with recommendations to strengthen the validity of assessments of technology integration.



Brickell, G. and Herrington, J. (2006) Scaffolding learners in authentic, problem based e-learning environments: The Geography Challenge. *Australasian Journal of Educational Technology*, **22**(4), 531–547.

The affordances of online learning technologies have enabled more widespread development of learning environments that facilitate the exploration and solving of complex and realistic problems. In this paper, we describe the design of a real world geography problem, embedded within a web environment that is facilitated by an onsite excursion for data collection. The learning environment has been designed to deliberately address known problems associated with the problem solving approach, specifically in regard to three issues, and uses scaffolding prompts and supports embedded within the environment to facilitate student learning. The paper describes the theoretical foundations for the approach, the design of the learning task, and specific scaffolding approaches used in the environment.

Brown, E. and Pluske J. (2007) An application of learning and teaching styles: A case study of science and engineering seminars. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

The ability of students to take in material taught at university level is a function of both their own personal learning style and the teaching style of the professor. The reality of many fields today, particularly in science and engineering, is that the dissemination of information at a professional level is often in the format of a seminar. An individual's ability to rapidly assimilate such information is often the key to success. This preliminary learning style trial aimed to assess students' learning styles using the Felder-Silverman Learning Style Model, to use student responses to evaluate teaching methods, and to identify future research needs within science and engineering seminar style units. Although limited in its scope to one unit at a single university, this preliminary trial can be used in a wider context as an example of how learning styles and strategies can be implemented into a real learning environment with genuine time and resource constraints.

Chou, C., Chan, P-S. and Wu, Huan-Chueh. (OnlineEarly) Using a two-tier test to assess students' understanding and alternative conceptions of cyber copyright laws. *British Journal of Educational Technology*.

The purpose of this study is to explore students' understanding of cyber copyright laws. This study developed a two-tier test with 10 two-level multiple-choice questions. The first tier presented a real-case scenario and asked whether the conduct was acceptable whereas the second-tier provided reasons to justify the conduct. Students in Taiwan (123 college students and 121 high school students) were selected to answer these questions. The results indicated that 66.16% correctly answered the first-tier questions, but only 36.84% students correctly chose the second-tier reasons. The researchers found that college students had significantly higher scores on both tiers than did high school students, but gender made no difference between the two groups. Three alternative conceptions that students have regarding cyber copyright laws were concluded from this study: (1) the Internet content is entirely open for the public to use; (2) the Internet is always free; and (3) all educational use is fair use. Implications of these results for college and high school courses and future research directions are discussed.

Choy, S. On. and Ng, K.C. (2007) Implementing wiki software for supplementing online learning, *Australasian Journal of Educational Technology*, **23**(2), 209–226.

This paper reports on a study which investigates the implementation of a wiki system as an additional tool to support student learning in an IT related course offered by the Open University of Hong Kong (OUHK). It focuses on a set of interview data related to the tutors' and students' views on and experience of their use or otherwise of the system in the course. The key results on the tutors' and students' participation in the wiki and factors which facilitated or hindered their use of the system are discussed. The findings indicate that the extent of training provision, the wiki pedagogy and participants' readiness for and awareness of their roles in a collaborative online learning environment are major factors affecting the effective use of the wiki. The add on nature of the wiki in this study also caused workload and motivation problems for the participants. Based on the results, strategies are suggested for implementing wiki based learning in both the OUHK and the wider academic context.

Clarkson, B. and Brook, C. (2007) Achieving synergies through generic skills: A strength of online communities. *Australasian Journal of Educational Technology*, **23**(2), 248–268.

Educators are often torn between impositions of the institution in which they work and the imperatives of their individual courses or units and the impact this tension might have on student satisfaction with the learning experience. It is common to hear that students must graduate with multiple generic attributes or skills, yet these skills may not be within the gamut normally required in a specific undergraduate unit. This paper reports on an attempt to integrate both University sanctioned or top down generic skills and an instructor's organic or bottom up desirable skills in a multimedia unit at an Australian university, and the impact this has on student satisfaction. Specifically both asynchronous and synchronous tools were used to facilitate online community characteristics, in turn usable to foster the generic skills of collaboration, communication and problem solving. Results reveal synergies between the possibly divergent and potentially opposed goals of the university and the classroom. This paper demonstrates the ways that the conscious promotion of an online community to simultaneously assist achieving both the unit learning outcomes and prescribed generic skills, caused no evident conflict for student participants.



Cluett, L., and Skene, J. (2007) A new(er) dimension to online learning communities: Using web tools to engage students. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

Gen Y students (born 1982-2000) are an increasing proportion of student populations. Their familiarity with Information and Communication Tools (ICT) is claimed by generational researchers to influence their approaches to learning and their expectations of university IT capabilities (Oblinger & Oblinger, 2005; Jeffries, 2003; Prensky, 2001). Universities are challenged to attract and retain these students who increasingly face competing demands on their time and expect institutions to respond with flexible services. This paper details the response in one university to the challenge of using the web tools that Gen Y students themselves adopt to enhance communication. It is from the perspective of a central unit charged with communicating with, and providing services to, the entire student body in a multitude of contexts. The applicability, usefulness, obstacles and associated pedagogical principles of ICT are explored and reported in this pilot project.

Cluett, L., Hogan, J. and Skene, J. (2007) Catching up with our students: Using web tools to create communities. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

This workshop builds on the experience of the Student Services team at UWA to generate a discussion about using web tools to communicate with students and build online communities. The session aims to briefly explain some of the tools available as well as to explore the potential for using them to build student communities.

'Web tools' is a name for a group of technologies that are commonly used in a range of online environments (a range of other terms is also used including Information and Communication tools; or ICT). The tools include blogs, wikis, podcasts and discussion boards and they are commonly used by individuals and groups across the world to communicate, share information and distribute media with varying degrees of formality. Such tools are increasingly being used by business, schools and more recently churches, charities and community groups.

The University sector in Australia has been slower to adopt these tools and this reluctance may be well founded. It is important that the tools are used as part of a broader educational framework and not because they are the latest fad to hit the Net Generation. At the same time, we also need to trial and evaluate available technologies as alternative means of communication, as they may be the preferred medium used by our students to communicate for good reasons.

Participants in this workshop will

- gain a greater understanding of how web tools can be used in higher education
- learn about successes and failures from others already using the available technologies
- discuss how to use web tools appropriately to engage students whilst maintaining personal interaction

There is an increasing focus in the media and at some educational conferences on the characteristics of the Net Generation or Gen Y, the students who are our school leaver cohort. These 17-24 year old students have grown up with technology and it is claimed that their exposure influences the way they in which learn and communicate (Richardson 2006). It has also shaped their expectations of their ideal learning environment, which, if not met to some degree, can result in low satisfaction (Hartman, Moskal & Dziuban, 2005).

Universities are keen to attract and retain students and so the quality of the student experience is a focus of most strategic plans. The challenge to engage students must be addressed in the classroom and in the broader university community. Here, Student Services has a role to play in connecting with students and facilitating their access to services that complement the learning achieved in classrooms.

Characteristics of the Net Generation to consider are that they value personal interaction and do not want that replaced, but rather enhanced, by the use of technology. They expect and appreciate flexibility and prompt responses and want information that will help them form conclusions, rather than being told the decision (Oblinger & Oblinger, 2005). Their peers exert a strong influence. Strategies for promotion of services should take these characteristics into consideration and adopt those tools that are effective in particular applications.

This session is not intended to serve as a lecture on ICT but rather will provide a forum where participants can interact, discuss and learn about issues relevant to them, their specific interests and appropriate to their institution. This workshop is suitable for the complete novice through to the ICT expert and for teaching, technical and professional staff. Ideas and discussion generated during the workshop will be written up and distributed to participants.

Condie, R. and Livingston, K. (2007) Blending online learning with traditional approaches: changing practices. *British Journal of Educational Technology*, **38**(2), 337-348.

Considerable claims have been made for the development of e-learning, either as stand-alone programmes or alongside more traditional approaches to teaching and learning, for students across school and tertiary education. National initiatives have improved the position of schools in terms of access to hardware and electronic networking, software and educational resources, and staff development. The potential of e-learning to improve learning and teaching, and in turn, attainment, may be contested by academics but the policy makers are generally positive. Many countries across Europe and North America have adopted information and communication technology (ICT) as a central plank in school improvement and effectiveness planning. At the centre, however, remain the teacher and the learner. The impact of ICT on the learning experience will depend upon the roles adopted by each, the model of the learner held by the teacher and the pedagogy adopted. This paper considers the ways in which teachers and students responded to the implementation of one particular online programme and considers the approaches adopted and the attitudes to its use. The SCHOLAR programme is designed to complement rather than replace traditional teaching and learning approaches within schools and is aimed at students in the post-compulsory years of secondary school



working towards external certification. It has a number of features including course materials, revision exercises, self-assessment facilities and a discussion forum. The independent evaluation of SCHOLAR looked at the impact that its use made on learning and teaching in the post-16 classroom and the differing ways in which teachers and students used the various elements of the programme. While it did appear to have a positive impact on attainment, the evidence indicates that this might have been greater had the teachers modified their practice, blending learning through SCHOLAR with more traditional methods.

Ellis, R., Steed, A.F. and Applebee, A.C. (2006) Teacher conceptions of blended learning, blended teaching and associations with approaches to design. *Australasian Journal of Educational Technology*, **22**(3), 312–335.

This paper describes the results and implications of a qualitative study into teacher conceptions of blended learning, blended teaching and associations of these conceptions with approaches to design for blended learning experiences. Twenty-two teachers from two campus based Australian universities were interviewed and the responses from them were categorised into qualitatively varied categories of conceptions and approaches. The distribution of the categorisation is considered in relation to the strength of associations amongst the categories. In doing so, this study builds on previous research into understanding what teachers think students learn, how teachers think they teach, and how these understandings are related in blended contexts to the ways teachers prepare student learning through design. The results show that teacher conceptions of blended learning that focus on the use of technological media as one way of achieving learning outcomes and supporting critical investigation by students tend to be associated with conceptions of blended teaching which focus on helping students to develop new ideas and understanding.

Freeman, M., Bell, A., Comerton-Forde, C., Pickering, J. and Blayney, P. (2007) Factors affecting educational innovation with in class electronic response systems, *Australasian Journal of Educational Technology*, **23**(2), 149–170.

This paper reports the use of Rogers' diffusion of innovation perspective to understand the factors affecting educational innovation decisions, specifically in regard to in class electronic response systems. Despite decreasing costs and four decades of research showing strong student support, academic adoption is limited. Using data collected from academic users, non-adopters and other stakeholders reflecting on factors known to affect innovation diffusion, we find issues of cultural compatibility, complexity and relative advantage to be the most critical aspects affecting adoption decisions. These issues partially negate the benefits of increased in class interaction and student engagement. Suggestions for overcoming these issues are discussed.

Freeman, M., Blayney, P. and Ginns, P. (2006) Anonymity and in class learning: The case for electronic response systems. *Australasian Journal of Educational Technology*, **22**(4), 568–580.

This research presents the results of a study of alternative response methods for in class formative questioning. Students' anonymity from their peers and instructor was studied through a research design that maintained a constant interactive teaching strategy in a large lecture hall, in all respects except for the method used by students to respond to the in class questions. A handheld electronic response keypad was the only approach affording complete anonymity. Student perceptions of the benefits of anonymity were obtained from a survey conducted at the end of the course. The results suggest that anonymity is a critical factor affecting student willingness to participate with in class exercises. Furthermore, the results indicate that students' propensity to engage with in class questions increases with the degree of anonymity provided to the student in revealing their response. The benefit of anonymity, combined with the increased availability and affordability of electronic response systems, will be of interest to academics keen to design engaging learning environments.

Giddings, L.S., Campbell, S. and Maclaren, P. (2006) Going online to learn health sciences research methods: The student experience. *Australasian Journal of Educational Technology*, **22**(2), 251–267.

Health professionals are attracted to the flexibility of the virtual classroom for their on-going education. Recent studies have documented the differences in pedagogy between Internet based learning online and the traditional classroom setting, but few have investigated student health professionals' transitional process while engaged in online learning. The purpose of this mixed methods evaluation study was to document students' experience of a six month online research methods paper (unit). Specifically it explores factors that influenced student transition to online pedagogy and successful completion of the paper. Descriptive qualitative and quantitative analyses were applied to 230 student evaluations and 1720 emails collected over a four year period. The findings supported those of previous studies; the main reasons students study online is the flexibility it offers (87%) and the ability to study without taking time off work (72%). The student experiences were captured in the overarching theme 'from enduring to enjoying'. A teacher who works within a collaborative team, engages students early with interactive skill acquisition learning activities, and is responsive to online students' unique needs, can successfully facilitate students through the virtual classroom transitional phases: from 'virtual paralysis' to 'engagement' to 'getting into it' to 'surprised enjoyment'. Without strategies in place, however, teachers risk being overwhelmed by the onslaught of student emails, with the allotted teacher-student contact time slip sliding away.

Gilbert, J., Morton, S. and Rowley, J. (2007) e-Learning: The student experience. *British Journal of Educational Technology*, **38**(4), 560–573.

The paper draws on in-depth qualitative comments from student evaluation of an e-learning module on an MSc in Information Technologies and Management, to develop a picture of their perspective on the experience. Questionnaires that yielded some basic quantitative data and a rich seam of qualitative data were administered. General questions on satisfaction and dissatisfaction identified the criteria that student used in evaluation, while specific questions of aspects of the module generated



some insights into the student learning process. The criteria used by students when expressing satisfaction are: synergy between theory and practice; specific subject themes; discussion forums and other student interaction; and, other learning support. The themes that are associated with dissatisfaction include: robustness and usability of platform; access to resources (such as articles and books); currency of study materials; and, student work scheduling. Aspects of the student learning experience that should inform the development of e-learning include: each student engages differently; printing means that students use the integrated learning environment as a menu; discussion threads and interaction are appreciated, but students are unsure in making contributions; and, expectations about the tutor's role in e-learning are unformed.

Green, R., Eppler, M.A., Ironsmith, M. and Wuensch, K.L. (2007) Review question formats and web design usability in computer-assisted instruction. *British Journal of Educational Technology*, **38**(4), 679–686.

We tested the effects of two embedded review question formats and the application of web design guidelines in a computer-assisted mastery learning course in developmental psychology. Students used either a branching review question format that redirected them to relevant portions of the study module after incorrect answers or a linear format that only provided the correct answer and then continued to the next review question. Students who used the branching format scored higher on their first attempt to pass the mastery quiz, and they required fewer tries to achieve the 90% mastery criterion. The effectiveness of web design guidelines was evaluated based on students' opinions. Students with positive opinions about the readability and navigational usability of the study module scored higher on their first quiz.

Grellier, J. (2007) Engaging first year science students through reflective practice. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

In 2004 a core unit was introduced into first year science courses at Curtin designed to give students a brief 'taste' of a broad range of scientific topics, while developing their research, writing and oral presentation skills. The unit was based on an interdisciplinary collaboration between scientists, who gave lectures and tutorials on science content, and Humanities staff, who conducted communication skills workshops in the context of the science lectures. A significant element of reflective writing was added to the unit in 2006, in order to deepen the students' engagement with the lectures, and to instil in them habits of reflective practice that would be valuable for their future academic and professional lives. While the communication skills staff coordinated the reflective writing, both groups of teachers assessed it. This paper will outline reflective practice theory, and present results of qualitative and quantitative research undertaken by the communication skills academics to examine the students' responses to the reflective practice component of the unit.

Hartley, J. (2007) Teaching, learning and new technology: a review for teachers, *British Journal of Educational Technology*, **38**(1) 42–62.

This paper reviews the effects of new technology on teaching and learning by considering examples of studies carried out with five kinds of teaching in five contexts. The five teaching situations are direct instruction, adjunct instruction, facilitating the skills of learning, facilitating social skills and widening learners' horizons. The five contexts are primary schools, secondary schools, higher education, special education and out of school. The aim of the paper is primarily to inform teachers about current work in these different areas.

Hemphill, L.S., Hemphill, H.H. (2007) Evaluating the impact of guest speaker postings in online discussions. *British Journal of Educational Technology*, **38**(2), 287–293.

This study investigated the impact of virtual guest speakers facilitating asynchronous discussions. The setting was an online instructional technology course with 16 graduate students and two guest speakers. The research reports the quantity and level of critical thinking of the students and guests. Each posting was coded for frequency and critical thinking. The results indicate that higher-order thinking occurred and student participation remained high throughout the length of both threaded discussions, regardless of the amount of postings and time spent by the guests. The findings support that guest speakers can be used sparingly in online discussions while still maintaining the quality of the online discussion and frequent, meaningful interactions among students.

Khalife, J.Y. (2006) Threshold for the Introduction of Programming: Providing Learners with a Simple Computer Model. In P. Romero, J. Good, E. Acosta Chaparro and S. Bryant (Eds). Proc. PPIG 18, 244 – 254. <http://www.ppig.org/papers/18th-khalife.pdf>

Computer programming learning/teaching has been an active research area in computer science and engineering. The difficulty level of the teaching/learning process that novices in computer programming report is three-fold, lack of problem solving strategies, misconceptions of code syntax and semantics, and inability to develop an adequate mental model of the machine. This paper examines major difficulties encountered by students taking introductory-level programming courses and it proposes a computer model that sets thresholds for defining basic programming concepts. The study's initial findings suggest that the adoption of the model succeeded significantly in improving students' academic achievement and perception of computer programming.



Liu, E.Z-F. (OnlineEarly) Developing a personal and group-based learning portfolio system. *British Journal of Educational Technology*.

The management of portfolios is a means of accumulating student assignments in an organised manner. Such assignments can demonstrate and elucidate the learning processes of a particular student (Liu, Lin & Yuan, 2001). The assessment of portfolios through peer evaluation and self-reflection enhances a student's critical-thinking skills and motivation to learn; thus, it is a good alternative method of evaluating college students (Reeves, 2000). In the past, portfolio assessment has focused almost exclusively on the outcomes of individual students. However, the integration of portfolio assessment and cooperative learning through a networked system has seldom been explored. For example, Chang (2001) designed a web-based learning portfolio system that provides some functions for assignment management and sharing—students can submit and collect their assignments as well as evaluate and browse through those of other students. However, Chang did not consider the functions for cooperative learning (eg. group composition, group-based peer assessment/self-assessment, group-based notebooks and group-based discussion forums).

Portfolio assessment undoubtedly has both advantages and disadvantages; one of the major disadvantages concerns the storage, search ability and management of learning portfolios (Russell & Butcher, 1999). To address this disadvantage, materials can be digitised and learning portfolios can be accessed through a network, while a database method can be used for management. In addition, making a database available on the Internet can aid in the documentation, arrangement, search and analysis of materials. In this way, both students and teachers can share and browse one another's learning portfolios, thereby providing an opportunity for students to interact with, observe and learn from each other.

In sum, this study attempts to utilise a network to establish a personal and group-based learning portfolio system characterised by cooperative learning. Moreover, this system should be user-friendly and useful to teachers as they instruct and evaluate students and document and evaluate student and group learning portfolios.

Löfström, E. and Nevgi, A. (2007) From strategic planning to meaningful learning: diverse perspectives on the development of web-based teaching and learning in higher education. *British Journal of Educational Technology*, **38**(2), 312–324.

This paper reports the results of a study on strategic planning and implementation of information and communication technology (ICT) in teaching and describes the level of quality awareness in web-based teaching at the University of Helsinki. Questionnaire survey data obtained from deans and institutional leaders, ICT support staff, teachers and students (n = 333) at the University indicate that strategic planning has proceeded well, and all the faculties of the University have developed virtual university strategies in order to continue existing ICT initiatives, to further increase the use of ICT in teaching and to assure student information literacy. The data indicate that all the faculties and institutions have monitored and reported the use of ICT in teaching, but quality assurance or enhancement as tools for monitoring were mentioned less frequently. The available ICT training was found satisfactory to meet the actual training needs of the teachers, but their lack of time was judged to be the main obstacle to their participation in it. The teachers identified two basic functions of ICT in teaching: (1) distribution of course material via the web, and (2) the creation of interactive and collaborative learning opportunities. The male teachers and students consistently estimated that their ICT skills were stronger when compared with the judgements made by female teachers and students. The teachers generally felt that the greatest problems arose from students' lack of time management skills and from deficiencies in the usability of the technology. The students did not perceive lack of time management as a problem. Rather, they experienced isolation, loneliness and the lack of practical ICT usability to be the main obstacles to learning. The teachers had a higher assessment of students' learning than the students did. The greatest difference between teachers and students concerned the contextual nature of learning in a virtual environment. The fact that the teachers' views were markedly more positive signals a distinct challenge for pedagogy.

Mearns, K., Meyer, J. and Bharadwaj, A. (2007) Student engagement in Human Biology practical sessions. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

Student engagement in their studies is a crucial influence on their academic achievement. When a unit is restructured, opportunities for this engagement may be lost. Human Structure and Development 2212 was created in 2004, an amalgamation of two smaller units. It is heavily practically based and it was determined that formal feedback was needed, in the form of questionnaires, to determine whether practical components of this unit were reaching their targets. It was discovered in this study that the students' perception of their tutors approachability and sensitivity, along with their perception of class organisation, was vital to their participation in the sessions. It was also found that the time of day or week that the survey was implemented had significant effects on student attitudes. Findings from this study have important implications both on the future direction of this unit and on the future implementation of Student Perception of Teaching (SPOT) surveys conducted in universities.



Meyer, J., Plastow, K., Sanders, K., Hill, J., Ziman, M., Fyfe, G. and Fyfe, S. (2007) Expectation, achievement and paid employment amongst first year human biology students. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

There has been a rapid rise in recent years in both the rate and extent of first year student participation in external paid employment in Australia and New Zealand, from 47% to 55% in the decade between 1994 and 2004 (Krause et al, 2005) to near 80% in mid 2006 (Applegate; Burgio). As well as raising challenges in relation to course delivery, this trend puts obvious pressure upon students' engagement with their studies as the focus of activities moves off campus. As part of a project designed to deliver effective online feedback we examined the relationships between engagement in paid work, expectations and achievements in a group of 1099 first year Human Biology students from three West Australian Universities. Seventy percent of the students surveyed were in paid employment, working an average of 12.7 hours per week. Ninety seven percent of workers classified themselves as full time students. There was no difference in the proportions of employment amongst full and part time students, but part time students did work longer hours. A higher proportion of females were employed, but males worked more hours. Fewer students speaking a LOTE at home worked, and those who did worked fewer hours. Expectations of success in Human Biology varied inversely with the number of hours worked, and the test scores of those claiming to have achieved at their level of expectation were lower. The range of uses to which feedback could be seen to be put also declined as paid workload increased. Working students were significantly more likely to feel that test scores did not accurately reflect their understanding of the subject. The implications of these findings are discussed.

Support for this (report/publication/activity) has been provided by The Carrick Institute for Learning and Teaching in Higher Education Ltd, an initiative of the Australian Government Department of Education, Science and Training. The views expressed in this (report/publication/activity) do not necessarily reflect the views of The Carrick Institute for Learning and Teaching in Higher Education.

Nicol, D. (2007) Laying a foundation for lifelong learning: Case studies of e-assessment in large 1st-year classes. *British Journal of Educational Technology*, **38**(4), 668–678.

Concerns about noncompletion and the quality of the 1st-year student experience have been linked to recent changes in higher education such as modularisation, increased class sizes, greater diversity in the student intake and reduced resources. Improving formative assessment and feedback processes is seen as one way of addressing academic failure, of enhancing the learning experience and students' chances of success in the early years of study. This paper argues that if this is to happen, a broader perspective on the purposes of formative assessment and feedback is required, one that links these processes to the development of learner self-regulation. It then shows, through two case studies drawn from the Re-engineering Assessment Practices project, how information and communication technology might support formative assessment processes and the development of self-regulation in large 1st-year classes. Finally, the paper presents a set of principles for the effective design and evaluation of formative assessment and feedback processes.

Northcote, M., Marshall, L., Dobozy, E., Swan, P. and Mildenhall, P. (2007) Using podcasts to enhance student reflection, involvement and engagement: Purposes, pedagogy, pitfalls, practicalities, progress and potential. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

Podcasting is a new form of online technology that allows for sound, graphic and video files to be regularly broadcast via the internet. Although this technology is frequently used for recreational use, educators also use this technology for teaching and learning purposes (Meng, 2005; Pownell, 2006). This technology is beneficial due to its widespread accessibility and replayability via desktop computers and mobile playback devices, as well as its capacity to enable users to subscribe to electronic audio and visual files (Cebeci & Tekdal, 2006; Leaver, 2006). The early use of podcast technology frequently involved the delivery of information to students, primarily from experts and teachers. However, more recent use of this technology has seen some teachers and students adopting a more democratic, student centred approach by exploring how podcasts can be used to encourage students' reflection about their learning (McLoughlin, Lee & Chan, 2006; Windham, 2005) and how students can be involved in accessing and creating podcasts themselves (Burrell, Griffin & Olivieri, 2006).

In order to encourage students to be more reflective practitioners and more engaged and involved in their learning, podcasts were created and broadcast to a group of on campus undergraduate students in the Bachelor of Education (Kindergarten through Primary) course at Edith Cowan University. These podcasts were created so that students could review their course material and become involved in contributing to and creating electronic course resources.

This paper reports on the initial stages of this project and focuses upon the pedagogical decisions behind the practicalities of how podcasts were used to enhance students' reflection and learning practices. The problems and successes experienced by both the lecturers and students associated with getting the project started are presented alongside some practical suggestions for those educators who are interested in using podcasting technology in their own teaching. To evaluate the pilot stage of the project and to inform the project's future, data were collected about the students' understanding of podcasts, their familiarity with podcasting software and hardware, their patterns of using podcasts and their preferences for using podcasts in the future. Findings from these data and their implications will be provided during the conference presentation.



O'Toole, G.M. (OnlineEarly) Multimedia-casting syndication for educational purposes Considerations of a Podcast for use in higher education. *British Journal of Educational Technology*.

A month ago the papers on Harvard Law's Podcast came across my desk as they were floating about the Educational Technology office suite here in the law school at the University of Denver. Having already implemented my own brand of multimedia documentary syndication, coined Quantumedia, on my personal site, <http://www.gregory-otoole.com>, I jumped at the chance to build something new and exciting—and highly useable—for the Sturm College of Law.

First, my explanation of Quantumedia (communication theory) should be clarified as: (1) the philosophical pursuit of the fundamental unit of electromagnetic energy; (2) multi/new media documentation; and (3) creative format critical analysis of one's immediate surroundings, their environment, socio-global issues.

My media theory work is a continuous effort of innovative cultural documentation with an emphasis on the very media through which the work is influenced, created and transmitted. Considering the historic facts of my field of research, starting in the 1950s media theorist Marshall McLuhan held that 'media are an extension of our selves'. If this is true, and I believe it to be, we can further his theory, and posit that 'the self can be a medium in turn'. This ongoing process of life witnessed (documented) 'through the eyes' of various new media is what I refer to as The Quantumedia Experiment.

Mine is an ontological perspective on the concept of 'life as art'. My work, then, is a philosophical pursuit of the fundamental unit of the life energy we know, that of electromagnetism, at the quantum level. A poetics of experience. The veritably abstract. Works that fall into such a category are not necessarily individualised creative works of any particular medium, nor are they the medium itself, as McLuhan also held in his widely popularised theory 'the medium is the message'... but, perhaps, the event of life itself as the work of art.

Oliver, B. and Goerke, V. (2007) Australian undergraduates' use and ownership of emerging technologies: Implications and opportunities for creating engaging learning experiences for the Net Generation, *Australasian Journal of Educational Technology*, **23**(2), 171–186.

Studies and commentary from the United States suggest that current undergraduates, part of the so called Net Generation, are high end users of emerging technologies such as mobile devices and new communication tools. This paper reports results from an Australian study of first year undergraduates which confirms these assertions: ownership of laptops, mobile phones and music devices appears to be growing rapidly among this group, along with their use of tools such as instant messaging, blogs and podcasts. Discussion of these results include suggestions as to how teachers of first year undergraduates can incorporate these tools and devices into extramural learning experiences in order to increase engagement and exploit the Net Generation's desire for 'connectedness'.

Oliver, R. (2007) Using technology supported inquiry learning to engage first year students in large classes . *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

This paper describes a study that explored the promotion of learner engagement among first year students through a technology facilitated inquiry learning approach. Students were given a series of authentic inquiry tasks supported by a raft of learning scaffolds. The technology facilitated system supported timely feedback and support and administrative efficiencies for the tutors and teacher. The study explored the forms of engagement that the Web supported inquiry based learning approach was able to engender among the students and the factors that were found to influence students' levels of engagement and achievement. Recommendations were drawn from the study for further instantiations of the approach with appropriate revisions and changes.

Phillips, R., Gosper, M., McNeill, M., Woo, K., Green, D., Preston, G. and Eckersley, C. (2007) Student perceptions of web based lecture recording technologies. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

Four IRUA universities - Macquarie University, Murdoch University, Flinders University and the University of Newcastle - have been collaborating on a project funded by the Carrick Institute for Learning and Teaching in Higher Education. This project investigates the impact of web based lecture recording technologies on current and future practice in learning and teaching.

The project aims are to identify:

1. *how web based lecture recording technology is being integrated into the curriculum, and its role and relationship with other elements within the curriculum;*
2. *how the technology can effectively support learning and teaching in different contexts, taking into account disciplinary differences, student diversity, specific teaching aims and learning outcomes; and*
3. *the educational implications of its use for:*
 - *the design and delivery of curricula*
 - *academics and their teaching*
 - *students, their learning and the establishment of effective learning environments*
 - *professional development of academic staff*
 - *academic policies and practices.*

A multi-level research program is underway to investigate these questions, initially surveying students on their experiences in the



use of web based lecture technologies. Subsequent stages will involve a staff survey, follow up interviews with students, the development of vignettes with staff about concerns they may have, and several case studies developing innovative ways of using these technologies.

This presentation focuses on the first stage of this project, a student survey focussing on pedagogical rather than technical aspects of web based lecture technology use. Preliminary results of the student survey, involving more than 750 responses from students in four universities, will be presented in this session.

Sandover, S. (2007) An introduction to problem based learning, *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

Problem based learning (PBL) was first introduced into medical schools in Canada in the 1960s. Since then, many medical schools and tertiary institutions around the world have implemented PBL representing a major change in educational practice. Much has been written in the literature about the advantages and disadvantages of PBL but it is still an evolving process.

There are many definitions of PBL but they all use as a starting point a 'problem' to be solved by the learner. The problem becomes the stimulus for student activity and drives the activities.

PBL is both a curriculum and a process. The curriculum consists of carefully selected and designed problems that demand from the learner acquisition of critical knowledge, problem solving proficiency, self directed learning strategies and team participation skills. The process replicates the commonly used systemic approach to resolving problems or meeting challenges that are encountered in life and career (Barrows & Tamblyn, 1980)

PBL uses a collection of carefully constructed problems that are usually presented to small groups of students. It is the students' role to work through the problem as a team. The students must identify what they know, what they don't know and how they are going to find out what they need to know. After allocation of learning tasks the students have time to research their topics and then return to apply the information to the problem. It is essential to this method of learning that the problem is designed so that the students' prior knowledge is insufficient for them to understand the depth of the problem. If this is the case, independent learning of a wide range of topics will be covered. With a well written problem in a well constructed curriculum, the learning tasks the students identify will be the core curriculum outcome.

In this workshop you will discuss the basic principles of PBL. Discussions will include advantages and disadvantages of PBL and some areas of curriculum development, problem writing and tutor training. At the end of the workshop you should be able to

- *describe the basic principles of PBL;*
- *describe basic principles of curriculum development;*
- *describe basic principles of PBL tutoring.*

Tikekar, R. (2006) Stroke of GENEous: A Tool for Teaching Bioinformatics to Information Systems Majors, *Bioscene*, 32(1).

A tool for teaching bioinformatics concepts to information systems majors is described. Biological data are available from numerous sources and a good knowledge of biology is needed to understand much of these data. As the subject of bioinformatics gains popularity among computer and information science course offerings, it will become essential for computer science and information systems majors to understand and appreciate basic biological concepts. The tool described in this paper involves the class working as a group on a project to design and develop an online database of interesting genes, proteins, and disorders. Students learn the complexity of life by searching for and finding data to populate the homegrown database. The project is highly extensible thereby making it possible for future classes.

Wiley, T. and Durey, A. (2007) Engaging students in a rewarding educational experience through rural clinical placements. *Student Engagement*. Proceedings of the 16th Annual Teaching Learning Forum, 30-31 January 2007. Perth: The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

This paper examines how rural clinical placements engage students in a rich and varied learning experience on several levels. Such placements offer students opportunities to deepen their understanding of issues related to rural health in clinical, professional, social and community contexts. In 2005, students across health disciplines from five Western Australian universities participated in rural placements lasting from two weeks to several months. All students responded to a survey about their experiences. Findings showed that contextualised learning engaged students on many levels and deepened their understanding of rural communities and issues related to rural health. Ninety five percent of students experienced rural clinical placements as a positive learning experience.

Ziman, M., Meyer, J., Plastow, K., Fyfe, G., Fyfe, S., Sabders, K. and Brightwell, R. (2007) Student optimism and appreciation of feedback, *Teaching and Learning Forum*, The University of Western Australia. <http://lsn.curtin.edu.au/tlf/tlf2007/abstracts.html>.

Optimism and self confidence are important factors in learning outcome and key determinants in student success at a tertiary institution. One factor that contributes to reduced success of students with lower confidence levels is the impact of feedback on their learning, and in turn this affects its value for these students. In addition large classes are a challenge for students with low self confidence and online feedback may offer a less confrontational strategy. In this study we investigate student response to feedback, in particular students' perceptions of the value of online feedback, relative to their self confidence as indicated by self predictions of grades. The student cohort is a large and diverse group of undergraduate students studying first year human biology in three Western Australian universities.



Results show that self confidence, sex, age and previous experience of feedback influence the way in which students value and use the feedback they receive. Optimistic students with confidence in their learning see many ways in which feedback can be useful to their learning. These students also tend to use feedback more constructively to improve learning outcomes. Students with little confidence in their learning ability are negatively affected by some forms of feedback and see fewer benefits in the feedback they receive. These results suggest that students with lower self confidence would benefit from more opportunities, at an earlier stage of their studies, to learn to reflect on feedback and build skills to use feedback constructively. The authors of this paper propose strategies to implement this support in large first year classes, using online assessment.