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 students	'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 students	'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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