Refereed papers

Using LAMS to facilitate an effective program of ICT instruction

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This paper documents how LAMS facilitated the re-development of a course designed to provide ICT skills to our future classroom teachers. The course was transformed from a purely technical, skills-based design to a format offering students a solid grounding in effective pedagogical approaches and learning design. Whilst still providing some generic ICT training, the course emphasis has been shifted to enable students to understand the pedagogical, philosophical and ethical implications of integrating ICTs into school environments and, in some instances, society at large.

Students are also required to design their own e-learning activity in LAMS using the literature to justify their choice of technological tools. Throughout this process the students are encouraged to workshop their sequences with their peers, critically evaluate others' work and reflect on the success of their own. The primary aim of this course now is to create learning designers who are intelligent and adaptive users of technology.

Keywords: LAMS, computer-mediated communication, learning design, teacher education, learning communities, collaborative learning, teaching and learning strategies,

Introduction

Two significant government studies, ''Raising the Standards'' (DEST 2002) and ''Making Better Connections'' (DEST 2001) raised doubts about the effectiveness of pre-service education in preparing teachers to integrate ICTs into their teaching practice and model positive attitudes to technology to their students.

> ''The need to better exploit the teaching and learning potential of ICT is widely accepted and supported. However, to date, this potential has not been realised in any significant way, particularly the potential to transform how, what, where and why students learn what they do (DEST 2002).''

Before these documents were released, the tutors in the School of Education at Macquarie University had already begun questioning the long-term value of the technology training being offered to prepare pre-service teachers for the hardware-rich school environments in which they will be employed. The two ''technology'' courses offered at that time by the School emphasised the acquisition of technical skills deemed relevant to future teachers (eg. word-processing, spreadsheeting, webpage design and familiarity with specialist educational software programs). In these courses, students were provided with traditional, directive-style skills training that was inadequate or out-of-date in a very short period of time.

An evaluation of this approach revealed that the majority of our graduating students had attained "Familiarisation" level or "Utilization" of Welliver's Instructional Transformation Model (1990) (see Figure 1) when their new employers (predominantly schools) were expecting recent graduates to be emerging at "Revolution" level (Cameron 2007). Even those students with high personal technical skill levels were only thinking about using ICTs at a fairly basic level in the classroom (Loughland 2003).

With the introduction of statutory requirements for classroom teachers to implement ICTs into their teaching practice (NSW Institute of Teachers 2004, Board of Studies 2007), the recommendation of the course evaluation undertaken by course tutors was that while pre-service teachers needed to be competent and confident users of today's technology, they also needed to be provided with knowledge about attitudes, values and pedagogical understanding in respect to ICTs (Cameron 2007). Students need to develop a fundamental understanding about the nature of technological change and their own abilities to confront this change (Phelps & Ellis 2003).

Familiarisation	Teachers become aware of technology and its potential uses.
Utilization	Teachers use technology, but minor problems will cause teachers to discontinue its use.
Integration	Technology becomes essential for the educational process and teachers are constantly thinking of ways to use technology in their classrooms.
Reorientation	Teachers begin to re-think the educational goals of the classroom with the use of technology.
Revolution	The evolving classroom becomes completely integrated with technology in all subject areas. Technology becomes an invisible tool that is seamlessly woven into the teaching and learning process.

Figure 1: Welliver's Instructional Transformation Model (1990)

It was also determined ICT-based courses hold more long-term value for students if the courses promoted generic technology skills and reflective activities that would assist the students in their continued learning throughout their careers (Herrington, Oliver & Herrington 1999). Therefore, rather than simply providing and delivering specific skills-based information, the tutor's principal function was shifted to create a collaborative, challenging and supportive learning environment within which students were introduced to a broad range of philosophical and pedagogical issues that arise from the integration of a variety of technologies in today's classrooms (Herrington & Oliver 2002). This approach enables the tutors to remove the students' reliance on direct instruction, which has been shown to lead to continued dependence on others for technology instruction (Phelps & Ellis 2003). This is particularly important to our students because in a school environment teachers need to develop adaptive technology skills, an ability to learn from colleagues and be able to offer support to their own students.

A new course direction was developed and the following became the criteria for the formal course evaluation:
Course tutors should ensure the course:
• Demonstrates a clear relationship between theory, research and practice;

- Provides opportunities for active student engagement;
- Contains both structured and unstructured time, with students encouraged to reflect on the implications of their learning activities on their professional practice;
- Models exemplary practice;
- Balances curriculum, skills and pedagogical issues; and
- Utilises a variety of presentation styles (Downes 2002).

The new course objectives were designed to ensure the course produces teachers who are confident and competent ICT users. On completion of the course, students will be able to:
- Recognize their role in the introduction of ICTs to their own teaching and learning;
- Use a wide range of technologies and resources appropriately;
- Develop, where necessary, their own ICT skills;
- Reflect critically on their use of ICTs for teaching and learning; and
- Appreciate the necessity of life-long learning about the potential of ICTs to enhance student learning (Downes 2002).

The features on which the new course is now based are discussed in more detail below. It should be noted that these are now totally independent of the technologies used and the activities are independent of the learning resources.

To ensure the new course objectives were met, the tutors re-designed the course in the following way (Alexander 2002):

- Good teaching practice was applied by introducing a constructivist approach, using authentic real- world problem-oriented activities and a just-in-time learning approach was employed toward ICT skills;
- The methods of assessment were revised to ensure that they reflected this change. The emphasis is now on the product of the "learner as designer" model (eg., students produce a lesson), higher-order thinking about the literature (eg., online discussions) and reflection (eg., an e-portfolio and lesson justification);
- Activities were introduced which encouraged the students to reflect on their own learning in terms of content, process and approaches the students may not have encountered before (eg., online collaborative group discussions, peer assessment and pedagogical justification);
- A range of additional scaffolds were established for students, (eg., readily accessible content delivery via a LMS, collaborative problem-solving (discussion forums and workshopping designs), and improved communication with course tutors (email and discussion forums)).

Methodology of course evaluation

The course tutors embarked on a formal evaluation process to review the original course content, skills and teaching approaches. A mixed method of research was adopted during the 12 month implementation phase: Quantitative data from students (exam paper results, course administrative data, tutor observations) were combined with qualitative data (questionnaires and focus groups) from both students and staff directly involved with the courses (240 students from 2 cohorts, 6 staff). A detailed evaluation process continues to monitor the newly adopted changes to measure their effect on student learning and over 500 students have now successfully completed the course.

Features of the new course:

Modelling best practice

A constructivist learning environment is now being modelled. Observing expert performances and the modelling of processes allow students to observe and reflect on activities before they attempt them themselves (Richards 2002). There is a now a focus on a wide range of approaches to learning and teaching, and on student-centred learning. No longer are the students simply page turning, but they are actively engaged in selecting which content and activities are most appropriate to achieving the course outcomes (Phelps & Ellis 2003). New approaches and technologies are modelled and students are given hands-on class time in which they can explore these with their peers. Students frequently commented on the questionnaires about this approach:

> "I liked the way that the workshops allowed us to explore what we were studying rather than just discussing it."

> "I enjoyed having the use of the computers in every class rather than talking about the technology in theoretical terms each lesson. The hands on approach made everything alot easier to understand."

Students are given choice about what they learn, and how they learn it to assist their learning independence and help them on their path to life-long learning. This change is grounded in the knowledge that life-long learning as a strategy can assist teachers survive the technological changes that will continue to occur (Downes 2002).

Online discussions

Interactions between students through online discussion forums, chat and other technologies can foster authentic learning opportunities that are more powerful than those conceived of within traditional interactive formats (Kearsley 2000) and it is considered more important for the students to be engaged in a meaningful dialogue about the information they find than to spend most of their time finding information (Schank 1995).

Three online discussions were implemented in the course: two of which are part of the assessment schedule (see sequence example, Figure 2). These discussions were designed to help students understand the pedagogical, philosophical and ethical implications of integrating ICTs into school environments and, in some instances, society at large. Controversial readings or provocative discussion questions introduce the students to alternative points of view with the purpose of promoting active classroom debate. They provide a theoretical underpinning for the course, help place structure and coherency in the students' learning, identify gaps in understanding and introduce the students to a variety of philosophical perspectives. A feature of the online discussions is that it allows simultaneous small group discussions. This provides students with a much greater opportunity to contribute than the 20:1 ratio of previous in-class discussions.
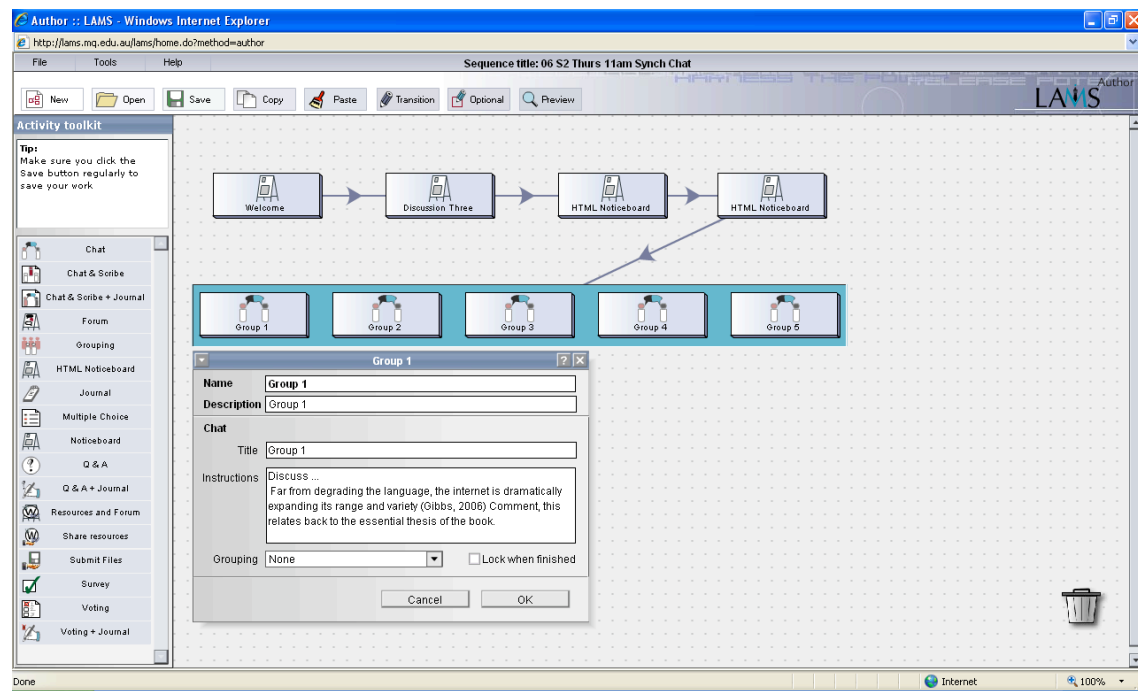
Figure 2: How the LAMS Chat was set up for the online discussions

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

The online discussions held in this course led to a deeper understanding of the set readings and improved engagement with their content (Cameron 2006b). Their use overcame many students' reluctance to join in the classroom discussions and avoided them being dominated by a small number of their peers. The use of the technology meant the discussion could accommodate simultaneous small groups and moved the discussion to a more student-centred activity. The quality of this cohort's work throughout the course confirmed the use of the online discussions facilitated student understanding and engagement with the course material. As one lecturer observed after marking the first cohort's exam papers:

> "It is the first time in my association with this course [5 years] that not one student has failed to be able to effectively discuss the issues surrounding the introduction of ICTs in an educational environment. The general quality of students' responses was vastly improved on previous years. The students have really engaged with the course readings."

Reflection: e-Portfolios

The creation of electronic portfolios to record their journey toward becoming a qualified teacher is much more than a product of technical skill.   They provide an effective on-going assessment tool and a transportable showcase of students' work for future employers (see Figure 3). The e-portfolios constitute an attempt to synthesise the students' learning across academic subjects and practicum. In this way the students gain valuable ICT skills in an authentic context (Loughland 2003). Research suggests that integrated approaches are far more effective than isolated ICT skills subjects for students to make use of ICT in their teaching (Downes 2002). This is something the students seemed to appreciate:

> "Compared to the other education courses I have done so far at uni I have found that this course provides the most practically applications for life in the workforce. I really liked the way the course forced you to actively think about how different subject areas could be taught with a focus on IT."

> "overall, it was far more enjoyable than any of the other education subjects i have done so far - it was actually relevent to what we will be teaching in schools!"
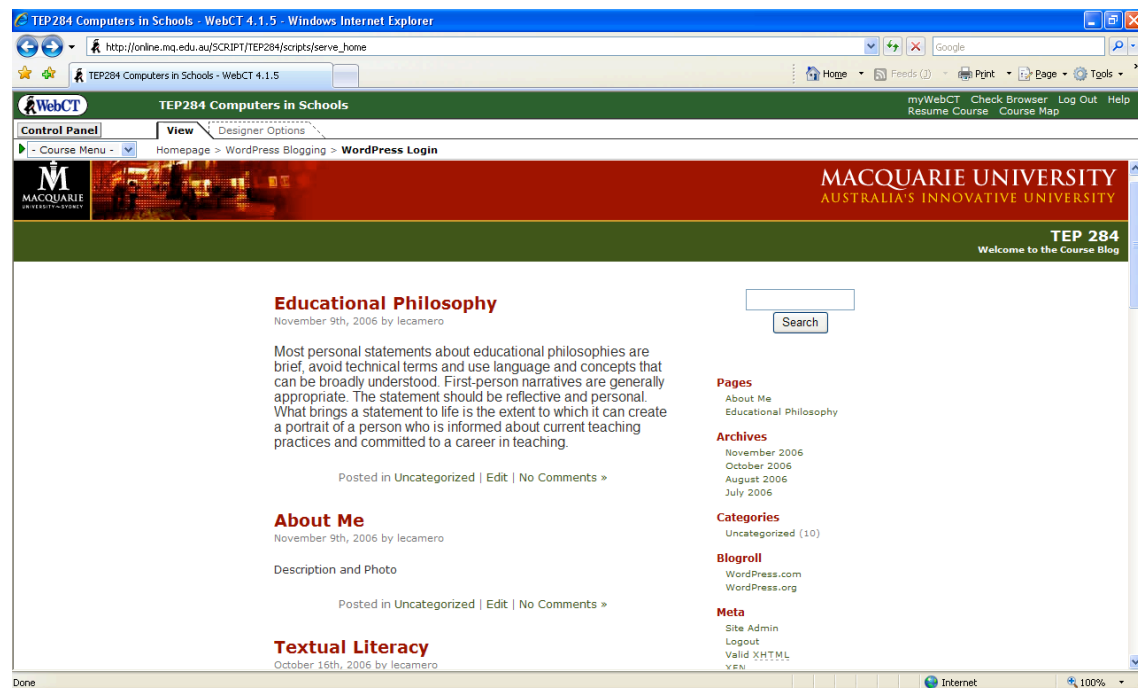

Figure 3: An example of an e-portfolio template in WordPress®

The e-portfolios require the students to think about multiple literacies and the use of hyperlinks encourages students to build an association of ideas rather than logically present a single linear argument (Loughland 2003).

Learners as designers

Activities are now directly related to assessment and there has been a movement away from formal essay writing. Interestingly, many students who performed poorly in the formal written assignment, often achieved excellent marks in these alternative, but equally intellectually demanding, assignments and reported high levels of engagement and satisfaction (Reynolds 2006). One student commented:

> ''I enjoyed the fact that assessments were not essays. I loved the fact that we could have a break from writing essay after essay and have the chance to do something a little different. I also felt the content was very well explained.''

Features that have been adopted to facilitate authentic assessment are: Open-ended assignments with a defined audience; readily accessible just-in-time skill instruction; collaboration and peer critiquing; and importantly, imagination, creativity and fun are encouraged.

The course is trialling the use of LAMS software as a scaffold for lesson planning with the students and has produced extremely positive results (Cameron 2006a). The most compelling reason to include this particular software over others was that, due to its highly intuitive nature, the students learn to use it in one lesson. This course has always had an e-learning lesson design component. Immediately prior to the course re-development the course required students to develop webpages. This involved 10 hours of tutor instruction in a specific version of single-purpose software which may not have been useful to the students in the future. It often had students preoccupied over technical issues rather than pedagogical ones which are considered to be more transferable. The change to LAMS allowed tutors to devote the bulk of their face-to-face time with the students to exploring effective learning design and the concept of good pedagogy.

Throughout the process of authoring a LAMS sequence, the students are required to think about all aspects of their lessons in detail and the software enables them to experience the lesson themselves via a Preview mode before using it in the classroom. The graphic interface allows students and their tutors to visualise lessons providing an instant 'picture' of the lesson and its content with a clarity not available in traditional written lesson plans.

During the lesson design sessions, collaboration, peer tutoring and workshopping of each others' sequences is encouraged. Not only does this develop students' ability to critically evaluate peers' work, it also helps them reflect on the success of their own product.

These students created well-documented lessons that illustrate a level of detail and a variety of activity that is often missing in the lesson designs of pre-service teachers. The combination of the pop-up windows asking for specific activity detail plus the coloured graphic interface enables the students to preview and overview designs in a way not possible with traditional lesson plans. Additionally, LAMS creates these lessons in a standardised template that can be easily modified for future re-use. The ability to readily re-use lessons presents new possibilities for increasing the quality and variety of teaching and learning within an e-learning context. When students were asked whether they might re-use their LAMS sequences, 98% replied they would:

> ''Yes i would if i was teaching a lesson on it- i think it was really useful.''
> ''Yeah, it will save alot of time and effort, and yet in my opinion be an effective study 4 years down the track.''

An essential part of the lesson design activity is that students are required to write a justification to explain their choices in the design and pedagogy of the lesson they have constructed. Students' are informed in their Unit Outline:

> "Our main purpose is to establish that you understand the pedagogical concepts involved and have the technical skills to construct a LAMS sequence. You are then to write a justification in the form of a report to explain your choices in the design and pedagogy of the LAMS sequence you have constructed. It would be expected you would use the literature to justify your approach and choices."

This is further example of encouraging the students to become reflective practitioners.

Student scaffolding - Access to resources and communication

As with many authentic learning settings, students required a range of scaffolds to assist them as they developed their knowledge and skills. After removing the lock-step tutor tuition (transmission model) in favour of the just-in-time learning one, it was considered essential that communication between students and staff, and students and students be improved. The course utilised a learning management system for this purpose (WebCT®) and LAMS was integrated into this (see Figure 4 below).

Figure 4: LAMS within WebCT®

Many of these supports are gradually reduced as the course progresses to the point where the students develop the capacity to cater for themselves. There is an intentional shift during the course from a situation where the tutors are continually offering just-in-time technical advice to one where peer collaborative problem-solving is encouraged. Student comments were very positive when asked about peer collaboration:

> "Yes, because it gave me different ideas in other creative ways that I wouldn't have imagined possible. By critiquing other's sequences I was able to critique my own with a learner's perspective."
>
> "Yes very, able to see difference [sic] sequences, able to improve on my own from looking at other ones"

Future directions

The next step in the move to the full and seamless integration of ICTs in the pre-service teacher education program is to include the material covered in this course within our existing methodology units and no longer offering ICT-specific courses. That is, teaching technology in context, modelling good practice and grounding our work in effective pedagogical approaches and learning designs – just as we are currently asking our students to do in this course.

Conclusion

The re-designed course aims to optimise the learning process by supporting the students in developing their understanding through reflection and justification in relation to authentic learning activities, with feedback from their peers and their tutors. It involved an iterative cycle of design, just-in-time-learning, experimentation, articulation of their ideas, problem-solving, adaption, justification, feedback and reflection (Laurillard & McAndrew 2002). The outcomes of the course now extend beyond "content" to include the development of a broader range of affective and cognitive skills and higher order thinking capabilities (Downes 2002). Of most value is not the technical skills we incidentally teach (ie. what buttons to press), but rather how we were teaching, and how we were training our students think about the implementation of technology in their own teaching.

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