Entering The Mainstream: Transforming Teaching Through Technology In Universities

Sub-theme: Transforming Learning Through Technology

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Abstract
Pressures on higher education from outside as well as inside to incorporate information and communication technologies (ICT) will continue to grow. Society expects graduates to emerge from their university experience with appropriate technological skills and abilities irrespective of the level of importance of such technology to individual disciplines. This paper reports on a cross disciplinary study that examines the use of ICT in teaching and learning contexts in two universities in two countries and focuses on teaching staff perceptions of how ICTs provide benefits to learning and teaching and raises a number of issues that need to be addressed before such technologies can be successfully integrated into mainstream teaching and learning practices.

Introduction
Universities are caught within a time of rapid political, socio-economic and technological change. The many internal and external pressures on universities have created the need to look at teaching and learning patterns and practices from a new perspective (Pittinsky, 2003). These pressures include a demand for a greater number of higher education places but no corresponding increase in funding (Albach, 1996); a larger 'clientele' of learners from varied backgrounds, with diverse needs, motivations, abilities, learning preferences, time availability and course content requirements (Bates, 2004); a demand for more client responsive and open and flexible courses (Ryan & Stedman, 2002); the need to seek alternatives to government funding; technology opportunities and the drive to use ICTs in teaching and learning (Allen & Seaman, 2004; Challis et al. 2005). Based on data collected from two universities in two countries, this paper examines the use of ICT in a university setting, focussing on teaching staff perceptions of how ICTs provide benefits to learning and teaching, and raises a number of issues that need to be addressed before such technologies can be successfully integrated into mainstream teaching and learning practices.

Various reports (for example, DfES, 2004; DEST, 2002; Sunderland, 2002) indicate that governments continue to actively encourage the higher education sector to use new ICTs in teaching and learning. The Sunderland Report in Hong Kong (2002), for example, recommends “teaching and learning be informed by continued attention to the educational opportunities created by… the technological revolution which is reshaping both the means of delivering education, and the opportunities for learning” (p. 29). Underlying
much of this encouragement, as Cuban (2001) points out, are often implicit and sometimes explicit statements that technology use has a positive impact on education, leading to a clearer and a better, more efficient process in education than can be offered by conventional approaches to learning and teaching. In Australia, in a presentation at a conference concerning the business of borderless education, Professor Web drew attention to the Labour Party’s Knowledge Policy statement that online education can be a relatively cheap way to improve access to higher education: “costs are lower for online delivery than other modes of delivery” (2001, p. 3). This notion of reduced costs of online education is supported by recent research conducted in the University of Texas that concludes:

it costs less to deliver college courses online, on average, than to teach them in a traditional face-to-face environment… The cost to deliver courses on a traditional campus came to $123 in 2003, on average... Delivering a course online… costs $88 in 2003 (Carnevale, 2005, p.34).

Full online courses, e-learning and in general the flexible delivery of courses have often been seen “as a panacea for the problems facing education” (Postle & Sturman, 2003, p. 1). The most commonly cited reasons for incorporating ICTs into higher education practices include that they: a) improve access to education and training; b) improve the quality of learning; and c) improve the cost-effectiveness of education (Bates & Poole, 2003). However, none of these outcomes are automatic, indeed, none are likely to eventuate unless the institution plans a long term strategy that includes the use of ICTs in the institutional planning (Bates, 2000; Collis & Moonen, 2001). In addition, Fox and Herrmann (2004) concluded that e-learning environments do not automatically improve access: if the necessary technical and networking infrastructure is not provided, if students do not have appropriate facilities or computer literacy abilities, access will actually be reduced.

The quality of learning depends on many interrelated factors, not least the methods of teaching, attitudes of staff and students to e-learning environments, the content and context in which the learning takes place and how teachers and students work within that environment.

This study focuses on teaching staff perceptions of the value of ICT in teaching and learning contexts and identifies issues that need to be addressed in moves towards mainstreaming ICTs in the two universities.

**Research aims and methods**
The research reported in this paper aims to: gain staff perceptions of the role and value of using ICT in their teaching; identify existing teaching practices, focussing on the use of ICT; and identify issues and common concerns that need to be addressed before successful mainstreaming of ICT can be implemented in the two universities.
The general orientation of this research is within the qualitative and interpretive domains. The empirical work undertaken was investigated through a broad ethnographic approach. Limitations to this approach need to be acknowledged. As Guba and Lincoln (1981) point out, an ethnographic study does not lend itself to producing generalisations. However, this research takes as valid the notion of 'naturalistic generalisms', as described by Stake (1978, p. 8) and that common findings across the two universities would be important to report.

Staff who took part in this study were asked to reflect on their experiences of using ICTs in teaching and learning contexts within the two institutions (one in Australia and one in Hong Kong). Data was collected through interviews with experienced and novice teachers using technology, as well as email communications with staff in both universities and finally through the reading and analysis of institutional review documents. From these sources, it was possible to identify a number of common themes, identified from multiple readings of the data, from which useful ‘generalisms’ emerged. In each account taken, individual teachers expressed strong views about the use of ICTs in teaching and learning. The reporting and writing up of outcomes of the various research stages was an iterative process, with each level of analysis revealing different perspectives on key issues identified, each one influencing further investigation. The outcomes from this research emerged from data induction, rather than imposed on the data by a theoretical hypothesis. In each institution, seven teachers participated. Informants were selected for interview based on gaining a broad balance of experience, seniority, gender and general levels of interest in using ICTs in educational contexts. The aim was to gain a spectrum of views regarding the use of ICTs from enthusiastic ‘technophiles’ through ‘cynics’ to ‘technophobes’ and varied stances in between (Bruce, 1997; Fox & Herrmann, 2000). The frequency with which certain themes or concerns were repeated was used as an indicator of their significance. It is these common issues raised that have formed the basis of this paper and are described under headings below.

All staff selected were users of ICT to varying degrees in teaching and learning. Staff were selected from different disciplines, from nursing, teacher education, journalism, engineering, social sciences and business.

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<tr>
<th>Disciplines</th>
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<td>Nursing</td>
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<td>Journalism</td>
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<td>Engineering</td>
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The interviews focussed on gaining a description of the teaching undertaken by the interviewee, students feedback, description of the role of ICT and how it was used, and the perceived importance of ICT, the degree of flexibility within the different courses and perceived benefits and concerns created by the use of ICT.

In both universities, the medium of instruction was English, though in one university the majority of students used English as a second language. Some cultural differences were identified but these were not seen as having a major impact on the findings of this study.

Research findings
Research findings have been grouped under headings that illustrate common issues and concerns raised by the teachers across the two institutions. Each theme is described and followed by a ‘generalism’ which emerges from the analysis of the data or strategy, currently used by the two universities.

Competing pressures on academic staff time
One issue facing learners and lecturers in higher education is having to learn and teach more in less time. Academic staff are involved in a continual tug-of-war for their time. These forces relate to the traditional demands on academic staff-time for research, teaching, supervisory and administrative activities and the recent and urgent claim which requires staff to engage in entrepreneurial activities in order to attract money into universities in an effort to diversify the funding base of tertiary institutions. As one teacher explained:

among the myriad of demands thrown up by these entrepreneurial pursuits are the tendering of proposals and applications for research grants to tight deadlines all of which take their toll on already limited academic time, leaving little time for developing and using ICT in teaching. Pressures… to incorporate ICTs into our teaching is just an extra burden (Engineering B1)

Based on the strength of concern expressed under this theme, it would appear that the two universities should acknowledge these pressures and be prepared to target projects across the institution which are strategically significant, rather than attempting to encourage a blanket use of ICTs and e-learning environments across the entire University community. It is also necessary to balance marketing desires which “often demand a strong web presence in all courses” (Business B1), with a more considered educational focus on needs and a practical focus on what it is possible to do well given staffing and resource constraints.

Multi-mode teaching
The two dominant modes of teaching, at the universities under study, were the traditional mode of on campus face-to-face teaching and the more recent internet-based teaching mode. While academic staff are struggling to integrate and rationalise these modes, the
current tendency is to use them in an *additive* fashion, one on top of the other and without any real rationalisation. As one teacher pointed out:

I am now required, as unit co-ordinator, to place all my teaching resources within the WebCT course room. This would be OK, but as much of my resources are not available electronically, I’ve been forced to re-write materials in PowerPoint or Word in order to upload them. As I change my materials each year, I’m not sure how useful this activity is. None of my students have commented on this extra resource (Business B1).

Another teacher noted:

I’ve put a lot of energy into developing innovative approaches to my teaching and incorporating activities using e-learning. My students seem happy with these developments … but I’m still taking the same number of classes and offering the same assignments I have used in the past .. the real problem is that I’ve become busier through using e-learning and there’s no reward for this … my contract will be renewed based on the quality and quantity of my research outputs, and not on innovations in my teaching (Social Sciences A1).

This common theme raises the question as to whether the struggle to integrate different modes of teaching and learning is making the best use of the modes available in terms of economics and also in terms of teacher willingness and ability to keep up with the demands on their time. Bates’ (2000) research in Canada indicates that this additive use of technology leads to increased workloads both for teachers and students. A carefully considered balance between the use of ICT, which replaces existing resources rather than providing a *supplementary resource* for teaching and learning is more desirable. This balance needs to be assessed across various levels within the university, faculty, course and unit team levels and supported by a strategically driven funding and support base.

**ICT impact across the universities differs**

Within this study, the degree of the importance of ICTs differed across disciplines and subjects. Not every discipline considered ICT to be important to their programs and ICT was employed in different roles in different contexts. As an example, one teacher explained how she used student electronic journals:

students are expected to keep a reflective e-journal when carrying out duties … They then send critical incidents they have described in their journals to me for comment – if something interesting comes up, I ask if I can share their incident with others to initiate discussion and thought about concerns in workplace practices (Nursing, A1).

Another teacher, also using student reflective journals to keep records of their learning in class, explained that her students are not encouraged to share their journals, but to use them to record what they have learnt in class and in their studies (Social Sciences, A1).
Several teaching staff in the study, however, would see ICT as central not only to the curriculum as an object of study, teaching and delivery, but to the research effort as a whole.

The way we teach journalism these days… just can’t be done without technology. In Journalism, it’s all about reading and writing and therefore practice, practice practice is all important… Wikipedia allows our students great opportunities to write and get published immediately and then for others… and not just other students, but anyone interested can comment and change the student’s text, send comments, provide feedback from across the world. … Journalists… real ones also interact and talk to our students. You can’t be a journalist and not understand technology (Journalism A1).

In other disciplines, lecturers did not consider ICT to be of central importance to understanding or teaching the subject matter but rather as adding a new and useful dimension to the discipline, allowing information to be stored and retrieved in new ways.

Thus, different disciplines and cultures within different faculties have different views about the role of ICT, and therefore, adopting a one-fits-all approach to using technologies across the board would be less helpful than providing examples of how the technology can be used successfully in varied educational settings. At the same time, faculties may need assistance in developing their own strategic planning in the use of ICTs. An effective initial strategy may be to target areas where ICTs is a critical part of the curriculum and where projects have committed staff teams to ensure the project’s success. The project outcomes, well documented and disseminated would provide exemplars of practice, leading others to follow suit in ways that are contextually appropriate for them.

**Changing attitudes changing practices in changing times**

Staff may be slow to take up the opportunities new technologies offer. They may also be reluctant to change their work practices or move outside their comfort zones. Two teachers expressed concern about changes created in student access to their time via ICTs: “I get students sending me messages on Friday night and expecting me to reply straight away. This is unreasonable. I can’t be expected to work 24 hours a day, 7 days a week” (Business B1). Technologies tend to change ahead of any changes in staff attitudes and abilities in using them (Taylor et al., 1999). And at this stage, across the two universities, it appears that only for a minority do new technologies provide new and exciting ways to work and teach. Yet there are instances where the use of ICTs provided new opportunities for students and teachers to work which are more appropriate than those opportunities provided through merely face-to-face environments. (Salmon, 2000; Collis & Moonen, 2001; Pelgrum & Law, 2003). One teacher reflected that her teaching had significantly changed and that this was directly due to the introduction of e-technology:
I had to learn new skills… I’ve found that I’m now able to do things in the classroom that were not possible before. I can bring in an overseas expert to discuss issues with my students, I can extend the classroom time by setting group activities in the discussion forum that require students to work outside class. My role has changed to become more a manager of resources and a stimulator for student activity rather than just the subject expert. …another thing I’ve noticed is students no longer have to work linearly through the course materials. They can choose sections they are interested in …, dipping into different sections to suit their immediate needs and interests (Engineering A1).

One teacher from education who made regular use of a web-based discussion forum stated: “I found it [the web-based discussion forum] really useful. It allows students to share views and comment on various practices and happenings during the practicums, when they are out teaching in the schools” (Teacher Education, B1). Another teacher suggested that communicating via the web form encouraged deeper, more reflective thought as

… my students had to think carefully in order to construct with texts about their experiences. The process of reading other students’ texts and composing responses led to students giving more time and thought to the texts they were creating and responding to. It seemed to me that this whole process helped my students to give more thought to their ideas than would be possible in a face-to-face verbal interactions… in which thoughts are uttered, shared and forgotten in seconds. And their ideas were held in the [online] forum for the entire term, which again provides further opportunities to reflect on the issues raised… The ability to record the student experiences for trainee English teachers, whose native language is not English, is very significant…and writing is so crucial to thinking about complex issues in a meaningful manner … the reflective and explicit nature of the written word is a disciplined and rigorous form of thinking and communicating … allowing time for reflection and facilitating learners making communication amongst ideas and producing coherent knowledge and structures… (Teacher Education, A1)

In another example:

ICT helps to bring the real world to the students…I use ICT to assist students to understand some key theoretical components behind the skill … of course, it does not replace hands on experiences, but provides students opportunities to produce in a simulated environment where they’re not harming anyone while learning’ (Nursing, B1)

As mentioned earlier, it is important to disseminate such practices university-wide in order to inform different disciplines who may then be able to adopt such practices to suit their own needs.
All staff interviewed in this study acknowledged the important role played by staff development in ensuring ICTs are well used. This point is supported by the research already conducted (e.g. Bates & Poole, 2003; Collis & Jung, 2003). Two key staff development issues emerged from this study: a) all new ICT projects must be carefully co-ordinated and integrated into the curriculum with strategies in place to involve not only the project developers but other academics within the Faculty. These staff will need support and training in using the e-resources and e-environments effectively; and b) an ongoing rather than “one-off” staff development program is required to ensure that not only the innovators and early adopters (Rogers, 2003) but also the majority continue to use and adapt the resources and environments to suit their own needs and those of their students. The resources needed to provide such staff development support may also need to be built into the cost of the IT project.

Choosing learning management systems
Although a few learner management systems (LMS) dominate within the two universities under study (notably WebCT and Blackboard), there were a number of other LMS environments commonly used by different departments, especially in one of the institutions. The main reasons for using a range of systems included the lack of flexibility offered by the major proprietary systems. As one frustrated teacher stated: “in our institution, we are required to use WebCT … which doesn’t allow other applications to be included within the system. This means there’s plenty of opportunities I and my students miss out on” (Engineering, B1). Another teacher described his enthusiasm for using Moodle, a free open source system that allowed him to tailor his environment to suit his subject area and class needs (Teacher Educator, B1). Wikipedia was also much praised for allowing users far more control over the e-environment than WebCT (Journalism, A1). The downside of using multiple systems as one teacher explained “is the lack of linking interfaces with the university student records and information systems and the web environment I use with my students for teaching, learning and research” (Engineering A1).

It would appear from the data collected that there is no single system that adequately meets the needs of all departments across the two universities. However, allowing multiple LMS may create complications when linking the systems to the central university student records and information systems.

Technology supporting small group work
Morrison (1995) and Albach (1996) noted that in universities round the world, class numbers have significantly increased and that there are fewer opportunities for conventional small group meetings. In this study, several teachers commented on how they used computer mediated communications (CMC) to organise ‘virtual’ small group work. For example, a teacher from business reported how she had used CMC to facilitate a small tutorial group:

In my course, CMC plays a central role… Students are expected to communicate, co-operate and collaborate with each other to succeed in the outside business world
as well as in my course. In the program, students (on campus and distance students) participate in computer conferencing. Study groups of around 15 students and a tutor who is responsible for five or six study groups are set problems to solve and plans to develop jointly. By co-operation through computer conferencing, students develop group based assignments. Marks are allocated based on the quality of interaction, content, outcomes, etc. My faculty provides a compulsory five week training program for academic staff to ensure they not only acquire basic technical skills but pedagogic skills using CMC effectively (Business B2).

In setting up the web environment, some teachers participating in this study were unsure how best to use the online discussion forum to attain “the pedagogic goals we had set ourselves” (Social Sciences B1). The teachers valued student discourse and felt that students would learn more effectively if they communicated with each other and with their teachers out-of-class online. But it was recognised that the online environment is also a hybrid form of ‘talking-by-text’ combining some of the linearity of text with the interweaving of open and critical forms of conversation: “CMC is different and as such privileges a different and quite unique discourse” (Social Sciences B1). As one tutor, co-teaching a course, pointed out:

This is a very distinct and fertile environment. ... it requires a different way of working as a teacher and a different way of studying for students. ... We started not knowing how we would go about doing what we wanted- to get students involved in a rich discourse.. we weren’t sure how best we could facilitate appropriate discussion ... not quite understanding the quality of that discussion or what it would require to keep it going. It’s been very much a learning process for all involved - for the tutors and the students. Our experiences in particular incidents of discourse have provided us with new understandings and insights. Last year the richness of the discourse was limited. In part this was due to the way we as tutors lead the discussions rather than stimulating and facilitating the discussions, I think we led too strongly. ... this year we’ve done things differently and students have taken far more responsibility for the interactions online. ... students have a strong commitment and desire to participate in the discussions (Social Sciences, B1).

It is clear that teachers in this study feel that students working collaboratively in small groups is an important dimension of the learning process and that the technology provides a new and important opportunity to carry out student collaborative work. As one teacher stated: “CMC fullfills a needs for collaborative group work” (Social Work, A1). This pedagogy driven use of technology was reinforced by Ehrmann (2004) in an external review of one of the universities in this study. His report identifies the level of success of the application of ICTs derives more from a close consideration of educational needs than the pursuit of the technological possibilities per se.

**Breaking the grip of print**
Teachers interviewed strongly supported the central role printed text still plays in teaching and learning in higher education. Having said this, there is a strong desire
amongst some teachers to ‘break the grip of print’ in favour of digital texts and “alternative representations eg the use of learning objects ....” (Engineering A1). An argument frequently used was “the more we place on the web, the less we have to print” (Teacher Educator, A2). Embedded in this assumption is that teachers will teach in exactly the same way as before, only now the paper-based materials will be in digital format. Another assumption made by the same teacher interviewed is that the digital media is cheaper than print. But this argument does not take into account amongst other factors, learning styles and student and staff preferences. For example, a) people may prefer to read texts off paper rather than off the screen (Ingraham, 2000), b) the costs of printing from the screen to paper are then borne by the student, c) despite this exponential growth in the use of e-learning environments reports indicate a significant increase in the use of paper across the two universities. The following strategies may need to be considered to address these issues in the two universities in this study: a) closer monitoring of use of paper, encourage recycling. Reward teachers who use less paper, set limits on laser prints and photocopying; b) review course curricula and consider restructuring the course to encourage the use of online resources and facilities; c) encourage faculty to adopt new technologies by providing strategically targeted funding for large scale ‘top down’ online projects and small scale ‘bottom up’ projects; d) provide incentives and rewards for documented educational improvements rather than clever uses of the technology; e) nurture and reward academic and support staff who are successful in improving teaching and learning through online developments.

Copyright
Copyright is one of the major constraints to providing study materials online and permission is not often given for making electronic copies of copyright held texts. As McGreal points out:

Like evil trolls guarding the gates, the copyright controllers are trying to hold sway over our actions and create walled gardens around knowledge repositories so that they can maintain full control over who uses applications or accesses content and when, where, and how they use it (2004).

Ongoing legal battles and the outdated copyright acts, are expected to limit the use of mainstream online environments as the sole form of study materials mediation. Most online courses offered in the two universities in this study, are accompanied by print-based readers which contain copyright articles. These are sent out to students through the ordinary mail or handed to students at the beginning of term. However, there is a growing number of readings which are supplied as electronic references to online line journals etc.

There is a strong consensus amongst most teachers interviewed that it is important to continue to support central digital storage of study materials developed within institutions rather than wait for a national/international resolution on the use of electronic copyright articles. Libraries are playing an increasingly important role in providing full text
resources online. As roles and responsibilities within the various academic support areas converge, closer ties between the academic support units can be expected.

**Student access and costs**
Fundamental to the decision to provide print or digital texts is the question of access. “Despite an enormous increase in student access in the last few years to online facilities, there remains a small but significant proportion of our students with limited access” (Social Sciences, B1). If only networked electronic resources are provided some students, particularly off campus students would suffer.

The two universities continue to increase their reliance on electronic networks the libraries have started to cancel multiple printed text subscriptions as they acquire networked licenses for texts. This decision, however, creates a new raft of issues that need to be considered such as student abilities in information literacy and basic IT skills.

**Conclusion**
Generalisms arising from this research Universities under this study need to consider many issues when opting to mainstream ICTs in teaching and learning contexts. Successful integration of ICTs and e-learning depends on many factors including the provision of co-ordinated, well-integrated and strategically considered programs and projects supported by documents and policies which are well disseminated to avoid lost opportunity and wasted energy. In particular there is a need for the following:

**Developing frameworks**
1. A clearly articulated framework on flexible learning based on critical and pedagogic concerns, related to each university’s strategic plans, especially their teaching and learning plans (or equivalent), to ensure overall direction and focus is maintained and that staff are not distracted from core university business.
2. A focus on teaching and learning issues, rather than an exploration of the potential of technology.
3. A strategic, rather than a ‘scatter gun approach’ to selecting, designing, developing and implementing online learning environments into the curriculum.
4. A considered balance between online technology used to supplement OR to replace existing teaching and learning activities.
5. The growth in online learning is facilitated by planned IT infrastructure and support which is appropriately resourced and maintained. E.g. online enrolments match developments in online courses and increased open access facilities for students.

**Staff development**
6. Ongoing rather than a series of ‘one-off” style staff development strategies is required. Although the emphasis of this staff development is likely to focus on academic staff, administrative and technical staff also need ongoing staff development to ensure co-ordinated support and a continued focus on teaching and learning issues.
Levels and kinds of support
7. A close examination of academic support services to ensure appropriate structures are in place which facilitate the attainment of goals set with the teaching and learning plans.

Rational resourcing
8. A strategic approach to implementing online learning must be matched by appropriate financial, technical, administrative and instructional design support. Central support staff, if directed to take part in one project, may need to have a reduced role for existing responsibilities and if necessary, those roles may have to be dropped during the life of the project. The implications for ongoing everyday core business need to be carefully considered.
9. Clear co-ordination and articulation between central, strategically funded initiatives which are supported by a co-ordinator of all projects to ensure: a) appropriate liaison between parties involved; b) dissemination of information between projects and through the University community; c) projects remain focused and on target.
10. Financial support be granted only when projects have clearly articulated an ongoing maintenance strategy of the site and appropriate monitoring and evaluation is ensured.

Recognising the impact of new technology adoption
11. Recognition that the impact on the curriculum, discipline, cultures and work practices of new technologies will continue to be enormous. New technologies can skew the university’s direction with multiple changes/innovations to key technologies, especially communications and information technologies. There are multiple issues confronting the use of online learning environments which need to be addressed, including:

- increased pressures on academic staff time,
- blurring and changing roles for academic and general staff,
- the need for changed work practices and a willingness to work differently with different groups of people in new ways,
- (in)appropriate uses of new technologies,
- access and costs to students,
- increased costs to the University and the Schools,
- copyright issues in online line environments, and
- innovation and change: how we overcome the chasm (Moore & McKenna, 2002) between early adopters and the mainstream.

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