

What impact has educational technology had on higher education teaching and learning practice?

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ABSTRACT

INTRODUCTION

This paper will consider the impact, over recent years, of educational technologies on teaching and learning practice in higher education. It starts with a description of the changing nature of the student body, and then compares research about learning with traditional approaches to university teaching. It then discusses the ways in which educational technology reinforces traditional approaches, and questions why both research about learning and educational technology have had little impact on learning and teaching practice at an individual or institutional level. The paper concludes with a discussion of how web-based lecture technology is acting as a perturbing factor in challenging traditional practice.

2.1 THE CHANGING STUDENT BODY

Student participation rates in higher education more than doubled from 441,074 students in 1989 to 984,146 students in 2006 (Universities Australia, 2008b, p. 15), without a commensurate increase in staff numbers. Consequently, class sizes have increased, and student/staff ratios increased from 14.6 to 20.5 between 1995 and 2006 (Universities Australia, 2006). With increasing numbers has also come the challenge of increasing diversity in the student cohort.

University students today have multiple competing priorities in their lives. The need to support themselves (and their families) means that university is no longer the major priority in their lives, as it might have been twenty years ago (NTEU, 2007, p. 13). McInnis & Hartley's work (2002) indicated that 72.5% of Australian university students have paid employment during semester, working an average of 15 hours per week. Students are demanding flexibility in time and space in order to be able to study effectively. They want to access their learning activities in ways which fit in with their work and family commitments (McInnis & Hartley, 2002 Ch 6). Meeting these student needs has placed some pressure on universities as evidenced in a recent study by Anderson (2006) which reported that 78% of students found that work impacted on their study, and 40% felt that their university did not cater well for students in paid employment.

The increasing diversity of the student cohort adds another element of complexity to the situation. Only 22.6% were aged under 20 in 2003, while 27.3% were aged over 30, placing approximately 50% of students between 20

and 30 (Universities Australia, 2008a). A much broader range of language backgrounds (AEI, 2007) and cultures also needs to be accommodated.

As a result of these factors, the ability of incoming students has decreased – there is now an increasingly diverse student body, with wide-ranging literacy and motivational levels. It is questionable whether traditional methods of teaching can meet the needs of such a diverse student population.

EFFECTIVE LEARNING

Over the last generation, a fairly clear understanding has emerged about the nature of the learning environment which can equip learners for the current era. This involves a largely constructivist pedagogical philosophy, a deep approach to learning, a student-centred approach to teaching and outcomes-centred subject design (Phillips, 2005). There is a focus on the needs of the student, recognising that learning is personal and social, and the role of the teacher is that of a facilitator or guide (Bransford, Brown, & Cocking, 1999). These characteristics closely match those of 'deep learning' reported in the tertiary learning literature (e.g. Biggs, 1999; Ramsden, 1992). A further research finding is that students can learn how to learn (Bransford, Brown, & Cocking, 1999), and this is important in the context of the diverse abilities of students entering university.

For effective learning to take place, the student should take part in activities which are intended to lead to learning. These activities are usually described in terms of outcomes or objectives. Allan contends that there are "fundamental conceptual differences between outcome-led design and the traditional university approach which emphasises input and process" (Allan, 1996, p. 104). The role of the teacher is, therefore, to design the learning activities, and to facilitate their productive use by the student (Laurillard, 2002, p. 24). Students today need support to learn how to learn, as well as support in what they learn. They need scaffolding and engagement with learning activities that help them learn in concrete ways.

TRADITIONAL APPROACHES TO TEACHING

The empirical results reported by Bransford et al. (1999) indicate that learning environments should be student-centred, knowledge-centred, assessment-centred and community-centred, reflecting a deep, organised and contextualised understanding of their discipline.

However, the teaching practice of many staff in most universities pays little heed to research about learning, and students are still taught in the way they were a hundred years ago, using a lecturing model with an emphasis on final examinations and little emphasis on scaffolding learning skills.

Traditional lecturing is mainly teacher-directed and content-centred, and has been criticised as leading to a surface approach to learning. Phillips (2005) has contrasted this so-called 'theory in use' (Argyris, 1976; Jackson, 1998) with the student-centred, outcomes-based and deep-learning 'espoused theory' developed from research into education. Argyris (1976) studied the concepts of Espoused Theory and Theory-in-Use in the context of leadership

education for adults, and found that the majority of adults who had been taught, and theoretically understood, the concepts of the Espoused Theory were not able to apply it, but, instead, reverted to their pre-programmed Theory-in-Use. Jackson (1998) applied these ideas to teaching and learning in higher education.

An often unstated assumption of the traditional teaching approach is that lectures are the core of the educational process: units of study are defined by the number of lectures; workload allocation is based on teaching hours; and academic titles (lecturer, reader, professor) privilege a lecturing approach. They began in the middle ages, when books were scarce, and the lecturer (reader) read the book to a class, because it was the most efficient way for learners to access the content of a particular book. However, the traditional lecture approach is "legitimised only by 800 years of tradition" (Laurillard 2002: 93).

It is questionable whether this traditional approach is serving the University sector well. The Graduate Careers Council of Australia conducts annual Course Experience Questionnaires which contain scales for good teaching and overall satisfaction. In 2006, from a sample of over 114,000, only 51.1% agreed that they had experienced good teaching, and 70.9% expressed overall satisfaction with their study experience (Graduate Careers Council of Australia, 2007). These results indicate that a substantial number of students are dissatisfied with the traditional university experience.

This paper does not argue that lectures are unnecessary. Lectures are a useful teaching technique in that they are cost effective, they can engage and motivate students and they can connect the lecturer and the student. Bligh's research indicates that "Lectures can be used to teach information, including the framework of a subject, but an expository approach is unsuitable to stimulate thought or change attitudes." (1972: 223). Recent work by Jones (2007) argues that lectures are not conducive to deep and/or active learning and various technologies can be used by students to access content. He argues that lectures serve to engage and motivate students, and "function more as a guide to than a précis of course material, pointing students in the right direction to explore and build their own understandings."

However, this paper does challenge the pre-eminent status of lectures (Phillips, 2005). Lectures are just one tool in the academic's toolbox - a range of other teaching tools are available, such as tutorials, practicals, assignments, but these activities are not accorded the same level of importance at the university policy level.

At the same time, this paper argues that the traditional model of university teaching is inappropriate to meet the needs and pressures of the 21st century: it poorly adapts to increasing student diversity and their need for flexibility and it is inconsistent with what is known about how people learn at university. Laurillard (2002) argues that the success of traditional approaches "*depends on the lecturer knowing very well the capabilities of the students, and on the*

students having very similar capabilities and prior knowledge. Lectures were defensible, perhaps, in the old university systems in which students were selected through standardised entrance examinations. Open access and modular courses make it most unlikely that a class of students will be sufficiently similar in background and capabilities to make lectures work as a principal teaching method.” (:93)

There may be alternatives to the traditional lecture/tutorial model, particularly in the current context where educational technologies are becoming more freely available, accessible and easy to use. In view of this, it is pertinent to ask how educational technology can contribute to the design of learning environments.

EDUCATIONAL TECHNOLOGY

There is now a fairly clear understanding that educational technology provides tools which can be used to perform learning activities, and which students can use in developing their own understanding of subject matter. This is consistent with the student-centred espoused theory suggested above. On the other hand, the history of educational technology over decades is littered with examples of products promoted as ends in themselves which would revolutionise education. However, when technologies are viewed as tools, the fallacy in this argument is revealed. In another context, Reeves used an analogy which is relevant here (Reeves & Hedberg, 2002: 35); that of a person claiming to be a 'hammer carpenter', who would only use a hammer in her work. While few people would claim that it is sensible for a tradesperson to use just one tool, this occurs relatively frequently with educational technology.

Examples of educational technology applications which meet the characteristics of the Espoused Theory are not widespread (see, for example (Reeves & Hedberg, 2002: Chapter 1), and the majority of examples of educational technology reported in the literature and available on the market have been developed according to a traditional model (Reeves & Hedberg, 2002; Schank & Cleary, 1995).

Over the last decade, use of educational technology, typically through Learning Management Systems, has become widespread at universities. It provides a level of flexibility sought by students, as a supplement to traditional face-to-face teaching (Harris, Yanosky, & Zastrocky, 2003), in what is called variously mixed-mode, blended or flexible learning environments (Lefoe & Albury, 2004).

While educational technology has enabled alternative approaches to teaching and learning, universities are still grappling with how to take best advantage of these alternatives (Collis & van der Wende, 2002). Research into the use of learning technology (Cuban, 2001) indicates that it is being used to replicate existing practice rather than being used in new ways. Learning Management Systems have been widely adopted at universities worldwide. A key enabling feature of these are the tools they provide for developing, organising and managing access to online content, but this strength can also lead to narrow

pedagogies – the delivery of content-centric instruction via a transmission model of learning is a common practice (Gibbs & Gosper, 2006). Analysis of computer usage logs (Phillips, 2006), and surveys (Platts, 2004), have reinforced this view.

A second technology which is becoming increasingly widespread is Web-based lecture recording technology (e.g. iLecture/Lectopia). This technology is designed to support a traditional pedagogical approach based around largely one-way mass lectures. Recent research found that both staff and students appreciated the flexibility this technology provided for students as a whole, and specifically distance students, those with disabilities and from non-English speaking backgrounds (Gosper et al., 2008; Phillips et al., 2007; Woo et al., 2008). Of the students using WBLT, over 75% indicated that this was because they could not attend classes, for reasons ranging from time-table clashes, work commitments, family commitments, and caring responsibilities. As well as providing flexibility of access, allowing students to catch up on missed lectures, students also used the technology as a tool for learning – to pick up on things missed in the lecture, revise for exams and revisit complex ideas. Overall, students reported strong positive perceptions of the benefits WBLT provided for supporting their learning and achieving better results.

This analysis indicates that educational technology has been used predominantly to support traditional practice, despite robust research about how it can be most effectively used. Given this, it is appropriate to consider the barriers to the adoption of reformed practice.

BARRIERS TO CHANGE

Human, institutional and cultural issues impede the widespread adoption of improved teaching practice. The personal beliefs and mental models of lecturers (Bain, McNaught, Mills, & Lueckenhausen, 1998a, 1998b) are one issue. “If educational development is about creating environments that encourage deep approaches to learning, then change in the mental models of lecturers is a key aspect of the process.” (Frielick, 2002: 16). These beliefs and attitudes are addressed fairly consistently through staff development.

However, even when academics implement innovations based on the espoused theory aimed at meeting the needs of students, often their efforts are not sustainable. This is because innovation by an individual takes place in the context of other subjects within the discipline, and the people teaching them. Individual innovation needs to articulate with other subjects and this requires the cooperation of colleagues, and especially the head of school. The innovation may also be inconsistent with a policy environment based on old models, e.g. assessment policies. Successful innovation can also be undermined by students' beliefs about university teaching.

Beliefs about how teaching is done at university is deeply entrenched in the university worldview (Ballard & Clanchy, 1988). Universities began in the pre-modern era (Phillips, 2005; Shulman, 1986), where knowledge was revealed and controlled, and control of knowledge pervades the culture of universities today. Universities evolved during the modern era, where knowledge was

seen as existing independently, where it could be discovered. These views also pervade the culture of universities today, underpinning the traditional view of teaching. On the other hand, current understanding about how people learn is based very much on a postmodern viewpoint, where knowledge is contextual and constructed.

One premise of this paper is that for change to occur in university teaching, and for educational technology to meet its potential to support this change, institutional beliefs about university teaching must be addressed. A very relevant question is why is university teaching and learning not informed by research?

WEB-BASED LECTURE TECHNOLOGY AS A DRIVER FOR CHANGE

One instance of research which can inform change is in our recent work (Gosper et al., 2008) that indicated that web-based lecture technology is acting as a disruptive technology (Christensen, 1997; cited in Smith, 2007). While WBLT initially seemed to support currently accepted teaching practices, it actually began to undermine those practices, with the potential to profoundly change university practice. Two challenges to lecturers and institutions were exposed by this research:

- The blurring of traditional boundaries and expectations of internal and external students; and
- Falling attendance at lectures.

Blurred boundaries

Current university approaches assume that students will attend campus and take part in face-to-face teaching activities. Where web-based lecture technologies are available, many internal students avail themselves of the flexibility provided, and exhibit attendance patterns more closely aligned to that of the traditional distance student. For external students, WBLT have increased their sense of belonging through close to real-time communication and access to up-to-date information. Moreover, the WBLT study found that students' use of the technologies were similar for internal and distance students (Gosper et al., 2008). Therefore, the common perception that students enrolled in internal and distance modes have vastly different learning experiences may no longer hold due to the possibilities brought about by WBLT and other social technologies.

Lecture attendance

A second key theme to emerge (Gosper et al., 2008) was that the use of WBLT changes lecture attendance patterns and changes the way students approach learning. Many lecturers have found that attendance at their lectures has markedly decreased. Substantial numbers of students also reported that they did not regularly attend lectures. Students reported that they found lectures valuable, but they did not need to attend them to learn from them.

Falling attendance has been problematic for many lecturers, and challenging to their conceptions of themselves as teachers and to their conceptions of

university learning. With small numbers in a large classroom, it can be difficult to be motivated and dynamic. Some evidence pointed to a lack of self-belief among lecturers, as if it was their fault that students did not attend. Many academics have a teaching perspective with a focus on nurturing their students (Pratt & Collins, 2001), and a key mechanism for this is through personal contact with students during and after lectures. A related issue was a lack of opportunity to receive feedback from students about how well they were understanding subject content.

Many lecturers seemed genuinely at a loss as to how to respond to the changing environment. Evidence from lecturers reflects three reactions to change identified in the organisational management literature: Resistant, Neutral, or Supportive. A small number of lecturers set out to force students to attend lectures through roll calls and causing important information not to be recorded (resistant); many lecturers made no change to their practices, despite the changes in student behaviour, or stopped using WBLT (neutral); and a relatively small number of academics responded by changing both the way they taught and the structure of their units (supportive). Those who did the latter seemed to have the fewest attendance issues, and the most positive perceptions of WBLT.

These academics tended to adopt a 'whole of curriculum approach' and used a range of teaching approaches and technologies, rather than just one, to meet the needs and expectations of students. These lecturers have adapted what and how they teach to match the way that students now learn and communicate, and report strong student engagement with their units.

On the other hand, the majority maintained a traditional approach to teaching and then were disappointed when students made a judgement that they could learn just as well by listening to lecture recordings and chose not to attend lectures.

In this way, web-based lecture technology has acted as a lens, bringing attention to numerous factors impacting on higher education in the 21st century. Originally, WBLT was introduced to respond to increasing student numbers and decreasing university funding. However, students have embraced WBLT as a way in which they can study flexibly in a society where they need to work an average of 15 hours a week (McInnis & Hartley, 2002), and where many have family and other commitments.

The lens offered by WBLT provides an opportunity to question the traditional pedagogy of university teaching, with its focus on the lecture. Academic development units and learning and teaching centres have been attempting to raise this issue in the collective consciousness of universities for at least the last 15 years, with little impact. However, the convergence of the economic and social influences described above and the impact of technologies such as WBLT are bringing these issues to the fore in a pragmatic way, because they threaten the viability of traditional lecturing.

CONCLUSION

This paper has analysed the impact of educational technology on learning and teaching practice in universities. It indicates that the traditional model of university teaching is problematic, but when there were few alternatives, this model was uncontested. With wide availability of educational technology and robust research about how students learn at university, the assumptions of the traditional model can now be questioned, and barriers to change challenged.

A strength of universities is the ability of their staff to apply analytical skills to problems and issues in the world. What is needed is for universities to apply their analytical skills to their own practice, that is, an expanded research agenda which looks at institutional barriers to change.

This paper also argues that educational technology has largely been used to support traditional approaches to teaching, and it explores this by considering barriers to change. While much work has been done to encourage individuals to change their practices, more work needs to be done addressing institutional barriers to change.

A case study of research into web-based lecture technology has revealed a blurring of the boundaries between internal and external study and increasing choices made by students not to attend classes. Web-based lecture technology, while designed to support traditional, transmission approaches to higher education, has actually become a driver for change, because students are using it to learn effectively in a complex socio-economic environment.

However, this phenomenon is challenging academics and institutions to change their practices and support a blurring of boundaries between internal and external study and support students who choose not to attend classes. This supports the contention made in the paper that lecturing is just one tool in the academic's toolbox.

Furthering the carpenter analogy, the successful teacher of the 21st century has a whole box of tools at his or her command.

One thing is certain – Pandora's box has been opened. It cannot be closed again!

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