ADOPTION OF NEW TECHNOLOGIES: THE NEXT CHALLENGE

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ABSTRACT

Computers have been used in teaching and learning for over 30 years, but their use in undergraduate science and engineering courses is still very limited. However, there is a wealth of excellent computer based resources around the world—some very good examples have been presented at the CBLIS conferences. These exemplary teaching packages are usually the product of enthusiastic staff, working in isolation or small groups and in many cases in their own time.

Many good computer based teaching approaches are abandoned or discontinued once the initiator or developer leaves the area to move to some other activity. This pattern is very common all over the world. Once a new product or approach is developed, having it adopted by other teaching colleagues poses a major challenge to the developer.

There are many issues related to the process of adoption of successful teaching and learning approaches using technology. This paper focuses on these issues, and discusses strategies to address them.

KEYWORDS

Computer based learning in science, managing change in higher education, adoption of new technologies

INTRODUCTION

The use of computers in teaching and learning has been the focus of academic debate for over 30 years. Their value in providing new and exciting opportunities for enhancing learning has been advocated consistently in tertiary institutions throughout the world.

Computer-based simulations, animations and interactive tutorial systems were the first learning technologies available to academics. Their potential of enhancing the understanding of difficult concepts, adding a visual dimension in the learning process, and helping students to progress through their studies in a self-paced manner was

rapidly recognised and advocated at local and international fora and conferences where numerous computer based presentations and training programs, intelligent tutoring systems, computer and web based collaborative approaches, multimedia learning tools and experimental simulations highlighted the potential of educational technology.

Over the last five years we have witnessed a rapid development of communication technologies which could add flexibility in terms of where and when teaching and learning take place, and also open students' remote access to a wide range of electronic resources available throughout the world. These technologies have the potential not only to enrich learning; they also have a great impact on the curriculum, the way this is conceptualised and how it is presented to students.

But how much change due to the availability of these new educational technologies has occurred at tertiary institutions in the teaching and learning processes? Have the ways students are taught and the ways they learn changed significantly over the last three decades? Has there been a significant impact on the curriculum? Even though there are some areas where changes can be identified, in general teaching and learning at tertiary institutions still mainly revolve around lectures and tutorials, a structure which was used before these new technologies were introduced.

Why is this so? Why is lecturing still the most widely used framework for teaching and learning when the opportunities the educational technologies provide are increasing at an exponential rate?

FATE OF IT BASED DEVELOPMENTS

The answer to the questions above is not lack of understanding of how these technologies could be used to enhance the teaching and learning processes. The number of computer based learning products has proliferated over the last decade; although not all of them are of high quality and efficient tools for learning, a large number of very creative and innovative technology based resources and approaches are now available to the academic community. At this very conference stream we have seen every two years a new collection of examples of the use of computer based technology to enhance the teaching and learning of science. But how many of these developments have gone beyond the pilot stage and became an integral part of a large scale teaching program? How many of these developments have had an impact on the teaching and learning structures of a university teaching program? How many of these developments transcended the tertiary institution where they were conceived and influenced the curriculum and the subject delivery at another institution?

Neither is the answer linked to an access problem. Although in the past access to modern hardware and software was limited to only an elite, this is no longer a major impediment in the use of technology in teaching and learning. There are too many examples of institutions reasonably well equipped, with a student population with an increasing computer and internet access in their own homes, at which teaching practices have changed very little over the last decades.

Despite the ready access to technology and to new teaching and learning tools developed by enthusiastic innovators, there is no evidence of a significant change in

the educational practices at tertiary institutions. Furthermore, valuable work and expertise of early innovators is lost in many cases. Why have not these innovative approaches been adopted by the rest of the academics? Why hasn't technology made a difference at our tertiary institutions?

ISSUES

A wide-spread adoption of new technologies in teaching and learning at universities has not occurred because there hasn't been a significant change in the way academics perceive their teaching role. The view of university teaching as transmission of knowledge is still widely accepted. The majority of teaching staff in higher education still practise their teaching with—what Biggs describes level 1—a "focus on what the student is", holding the view that a teacher is the knowledgeable expert who expounds the information the students are to absorb and report back accurately and it is up to the students to attend lectures, to listen carefully, to take notes, and to read the recommended readings [1, p. 21]. In this scenario there is no need to make use of technology to support alternative approaches to teaching. In addition, at traditional universities teaching is still generally conceived as a distraction from research, rather than a core academic activity; this is particularly the case with science academics. Consequently the academic commitment to teaching follows the rule of minimum effort required, which cannot be conductive to investigation of and experimentation with new teaching approaches of any kind, including the use of educational technology. Paradoxically, in many cases academics heavily use and rely on modern technology in their own research, but fail to expose students to the same experience. The most vivid example of this is the use of computer algebra systems in mathematics: despite the possibilities these offer in mathematics education and the impact they have on curriculum, its use with students is very limited, while at the same time these systems are changing the nature of research in many areas of mathematics.

The perception of the academics' role as teachers is hence the main impediment of a wide adoption of new teaching and learning approaches supported by technology. There are some positive signs that universities are paying more attention to teaching and are putting the students at the centre of university activities. However, at this stage, this is mainly visible in vision statements and the enthusiastic new approaches taken by scattered individual academics and smaller institutions, but has not yet translated widely into practice.

Associated with how academics perceive their teaching role, is the issue of fear that these new tools will eventually replace lectures, and that lecturers will lose control over the teaching process. This fear is unfounded and can be dispelled once it is realised that the role of academics is no longer the transmission of knowledge, and the teaching skill of academics reaches the level described by Biggs "with a focus on what the student does" where the role of the academic as teacher is perceived as providing a teaching context for learning.

There are other issues which are influencing the process of adoption of new technology in teaching and learning at our tertiary institutions. Many academics argue about insufficient research results that evidence the effectiveness of the new teaching tools to improve students learning. This is a flawed argument: even though there is no

evidence from research that the traditional lecture based approach is effective in supporting students learning, lectures provide the most common teaching framework in higher education; the reason for using this approach is simply historical and is highly rooted in higher education teaching practice, that's how teaching was carried out at universities over the last century, and that's the way the current academics learned. However, it is true that more formal and systematic evaluation needs to be carried out to establish the effectiveness of new tools in teaching and learning; much of the reported evaluation so far consists almost entirely of anecdotal evidence.

Finally, there is the issue of technological literacy, including fear of technology. This again is closely linked to the perception of the role of academics as educators; the role of teaching as providing a context for learning implies a continuous process of learning new skills needed to investigate, trial and implement new approaches that are relevant to today's students. This learning is not always properly and strategically supported in the university departments.

ADDRESSING THE CHALLENGE

The process of adoption implies change in the way academics go about their teaching, and hence it has all the complications inherent to planning for and implementing change in higher education.

Addressing the challenge of adoption of new technologies to enhance teaching and learning at tertiary institutions is far more complex than the actual development of new programs and support systems which use educational technology, as it is part of the much bigger challenge of changing the academics' perception of their role as educators and hence it requires the involvement of whole academic units responsible for the teaching programs. Adoption is a process which needs to be managed as a culture and curriculum change in higher education, a change which has as its primary goal the improvement of student learning. This process needs to be informed by what is known about student learning and must be addressed through proper organisational changes [3, p. 227].

As pointed out by D Laurillard [2, p.4] in the context of flexible learning, this process of developing and implementing technology based approaches needs to deal with the complexities of university culture. Traditional university culture is a "person" culture which does not always find the switch to a more industrial "role" culture necessarily beneficial to scholarly aims. The production and implementation of a new technology based teaching and learning tool requires however, a team effort.

A successful adoption of a computer based teaching and learning tool can follow only a well planned pilot development which included consultation across all parties involved or likely to be involved in the future. A tool developed by an individual working in isolation without input from colleagues is very unlikely to be adopted by the rest of the academic unit.

Strong leadership is required to define the culture, the philosophy, the educational rationale, and its place in the curriculum before piloting the development or adaptation of a new computer based approach. Successful developments, adaptation and

adoption of new teaching and learning approaches using educational technology could be achieved only in an environment where teaching is seen as providing the context for learning. As indicated by Ramsden [4, p.18] the role of today's academic leaders is to help their staff to make a radical shift from a view of teaching as transmission of knowledge, to one of directly attending to the process of their learning.

Successful wide-spread adoption can only occur when it is part of a shift in teaching practices. Before an academic unit embarks into a new development, it needs to come to a consensus on the need for change, on what its main objective is, on how it fits in the teaching program, and how will students and teaching staff use it. Only after consensus on these matters is reached and the development is successfully trialed, the large-scale implementation can begin. The leader of the academic unit will also have to ensure collaboration between staff as well as guide the planning, resourcing, development and evaluation of the new tool or approach. In addition, all staff involved will need to be supported with appropriate teaching and technology training.

Finally, teachers will embark in innovative approaches only if they perceive that their work is valued and that good teaching is a top priority at their institutions. It is of paramount importance that new reward structures are put in place to include discretionary awards, promotion, recognition of leadership achievement, and encourage classroom research.

CONCLUSION

Educational technologies have the potential to change the ways students acquire knowledge and develop the skills they seek, and they also have the potential to change the ways the curriculum is created and implemented. Since the advent of computers and later the communication technologies and the realisation of the roles these could play in enhancing teaching and learning, many innovative technology based ideas have been trialed in higher education. These were, for the most time of the last thirty years, developed by enthusiastic academics working in isolation, and most have not lead to wide-spread adoption at the institution where they were developed. A lot has been learned from these isolated attempts; reports on their educational rationale, development, and trialing have been made available through numerous conference and journal publications. However, very few of these developments had a wide impact on the relevant curriculum and teaching practices.

Tertiary institutions can no longer focus on funding individual projects without proper strategic planning. It is recognised that if we are to give students an honest and relevant curriculum, then we must integrate computer and communication technologies in the learning process; we need to prepare students for the environment in which they will operate. The development or adaptation, piloting, and adoption of any information technology based tool needs to be managed at an organisational level as a culture change in higher education, involving strong academic leadership to encourage a collaborative approach where the ownership of the new tool and corresponding new curriculum vests on the whole academic unit. This is a very difficult task given that academics are used to work in isolation, but it is possible if a proper environment is set to encourage academics to re-conceptualise teaching for the twenty first century.

REFERENCES

1. Biggs, J. 1999, *Teaching for Quality Learning at Universities*, SRHE and Open University Press
2. Laurillard, D. & Margetson, D. , 1997, *Introducing a Flexible Learning Methodology: Discussion Paper*, GIHE Griffith University
3. Laurillard, D, 1993, *Rethinking University Teaching–A Framework for the Effective Use of Educational Technology*, Routledge
4. Ramsden, P. , 1998, *Learning to Lead in Higher Edication*, Routledge

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