

experiences of developing technology based training. Thus, we are reasonably confident that that exercise has sufficient validity to meet the goals we set. Assessing its impact on the key competences identified by Seabrook and Grigg (2000) is more difficult. Certainly the participants say that they 'enjoyed' the experience and now feel more competent, but the only reliable measure will be to monitor the performance of companies and individuals over a period of months to see whether they really are more competent in working with clients and suppliers to commission and develop high quality, effective learning materials.

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Digital Environments: Monitoring Changes to Teaching

Abstract

The pressures, from outside and inside universities to digitize, to computerise, and 'to go online' continue to increase in pace. The rhetoric surrounding such pressures are often argued from a standpoint that positions technology as a 'neutral tool', a tool that will help make work more efficient and effective. The central thesis of this paper is that technology is best understood as fundamentally non-neutral and that various technological applications *privilege* certain ways of doing things, and exclude or restrict other ways. And further, that technology not only influences but can have a transformative effect on what the technology is used for, and on the work practices of those that use it. This paper draws attention to certain practices and changes in work practices in higher education, brought about, in part, or in whole, by the use of the new information and communication technologies (ICTs). In order to draw attention to these changed practices, this paper has been organised under four broad categories, namely: new pedagogical opportunities, changed practices, technology neutrality, and unintended effects.

Introduction

What might help us to rethink the way we use new technology is to develop a model that encourages us to critically question any form of new technology adoption. This paper proposes one such model. The model consists of four elements that need to be mapped onto any decision making process, in reviewing new technology for teaching and learning. The four elements are: new pedagogical opportunities; changed work practices, technology (non)neutrality and unintended consequences of new technology adoption. Each of the four elements applied to educational practice is outlined below.

New pedagogical opportunities

New pedagogical opportunities can be viewed at two different levels. The first level relates to new opportunities to do the same thing we have always done, just adding the technology to it, perhaps making us 'more efficient'. This can be exemplified by viewing activities, which are the same, though 'enhanced' or 'made easier' by the use of new technologies. For example, placing lecture notes and PowerPoint presentations on the Web, providing students with an alternative source to receive lectures notes and PowerPoint presentations, perhaps, in advance of a lecture. There may well be advantages of using new technologies in this way, but if this is all we are doing with the new technology, I would question whether we should bother. Are there real advantages, for example, in transferring notes designed in one medium and placed to another? What is the add-on value for the students and for the lecturer in doing this?

The next level of opportunity in using new technology is enabling us, as teachers and our students as learners, to do something different. Something we would not have been able to do without the use of the new technology. For example, the Web has many useful ready-made resources we can tap into. Rather than developing our own content for the course, we could set students activities to use relevant resources already developed online. One online resource that exemplifies this notion of new and different pedagogical opportunities, is the 'Active World's Universe' – <http://www.activeworlds.com.edu> - which enables students to explore subject environments in simulated settings. Students and teachers from various educational institutions around the world are able to communicate, collaborate and interact with each other to solve various problems and activities within these environments. Research studies exploring the potential of such environments include the following: Dickey, 1999; Pelgrum & Anderson, 1999; Law et al.,2000; Jonassen, 2000.

Changing work practices

Changing work practices refers to the changes in the way we work, how we work, who we work with and what we work on. New technologies place us in a different position to that we have previously been in.

One example of changes in work practices relates to work time. A lecturer may respond to student queries late at night, if she is 'online' and has a relevant response to make. This shift in work time and the speed in which responses can be made, may well change student expectations regarding, for example 'turnaround time': the time taken for lecturers to respond to student queries. These changes in work practices need to be monitored to ensure students, teaching staff and academic managers are aware of these changes as they occur and therefore are able to make changes to operational plans accordingly.

Technology (non)neutrality

Bowers (1988, p. 26) states that a 'widely held view within our culture is that technology is neutral' and is

seen to function best when we are unaware of it, when it is 'transparent' and does not interfere with what we are trying to do. In this paper, I contend that technology is not neutral and hence it has an influential and transformative effect on what it is used for and how it is used. For example, the ease with which some Web courseware tools allow us to transfer our MsWord files into the Web, encouraging us to transfer text designed in one medium into another. A common term for such activity is known as 'shovelware' (Hopper, 1999). It should be noted that recent research into reading (eg Rohonyia, 1999; Lander, 1999) reveals that we read very differently off screen than we do off paper. In addition, Schriver (1997) points out we tend to read less accurately and slower off screen than off printed pages. If we are guided by this research, we need to think critically about what resources we place online and how we expect our students to use the online resources we provide them.

Unintended consequences

The uncritical adoption of technology to educational settings is not a new phenomenon. However, because of the perceived benefits which technology can bring, there is a danger that education becomes captive to a non-problematised use of technologies (Green, Gough & Blackmore, 1996) without considering how it effects and transforms various contexts and situations (eg Kling, 1996). Seldom are there public discussions about the potential problems and consequences of adopting a particular technology or even if there are unintended consequences of adopting a technology which may not be apparent at the time (Tenner, 1996; Burbules & Callister, 1999). Technology is often cited as the way to overcome problems or difficulties faced. However, the unintended consequences are often hard or impossible to predict and are only realised after a passage of time. Too much emphasis on providing materials online can backfire, as Shirley Alexander found (1998). In a presentation on her research, Alexander reported that several students had strongly objected to too much online work. As one student told her: 'I did not come to university to read text off screen!'

Final comments

This paper has reviewed some of the complex and interwoven issues of technological practice and change. The relationship between the use of new technologies, especially ICTs in higher education, academic practices and the varied contexts in which these practices occur, are complex and changing. These complexities can be investigated by examining staff perceptions of their role, the role of technology and its use in the institutions and by the use of the model introduced in this paper. The four broad concepts have been introduced in an attempt to maintain a *problematised* view of new technology adoption.

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Educational Software for Computer Engineering: A Case Study of an Interactive BDD Tool

Abstract