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The Effectiveness of E-Learning in Higher Education: A Case Study of University of Dundee, Scotland, United Kingdom.

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Abstract

An appraisal of the contributions and limitations of technology in supporting and improving lecturing at a low cost urgently required, as governing funding per student has halved in real terms over the past 20 years especially in England, as noted by Gibbs (2006). A variety of technologies are used in higher education, one of the most prevalent of which is Interactive Whiteboard (IWB), a device that is economically significant at a time when universities are reducing the number of lecturers whilst taking on more students. Technology such as IWB currently plays a crucial role in higher education, since it is an interactive, visual medium that can help students by illustrating points with graphics, pictures and models. IWB can also act as a Human Input device (HID), hence its adoption by the University of Dundee's department of Economics Studies in 2009. This qualitative study explored the effectiveness of IWB in teaching and learning in higher education. Two questionnaires were used as a means of collecting data, the reason being that they are reliable, unambiguous, uniformly workable, easy to administer, cheap and fast, according to Anderson (1998) and Altrichter et al (2008). The good thing to emerge from the students surveyed is that 95 percent of them believe that IWB is critical to learning because it helps them to recollect the content of lectures,

since the IWB enables lecturers to record their instruction as digital video files and post the material for subsequent review by students. Findings also showed that IWB systems can help lecturers to elucidate complex issues. In short IWB was found to be efficient and effective in the delivering of lectures and in improving lecturer's teaching skills. In conclusion the study showed that universities must cut costs, as well as investing in new technologies that, when used properly, will save money and enhance both teaching and learning in higher education world over.

Keywords: higher education, interactive whiteboard, attendance, lecturer, student, e-learning environment, technology

INTRODUCTION

The increasingly innovative use of technology in higher education is attributed to its effectiveness in providing more scope to scholarship. Technology, it is assumed that enables lecturers to improve their competences and knowledge by creating new, efficient approaches to learning, as well as effectively supporting all aspects of higher education. It is significant to note that literature assumes that technology is used in order to stimulate students and help them achieve their potential, not just to save money. A variety of technologies are used in higher education, one of the most prevalent of which is Interactive Whiteboard (IWB), a device that is economically significant at a time when universities are reducing the number of lecturers whilst taking on more students. Hence the traditional approach to teaching in higher education, in which the lecturer is the expert and students are passive recipients of knowledge, is no longer sustainable; rather teaching is now a special form of communication in which both voice and numerous non-verbal factors are significant. In fact, education involves building bridges between the lecturer's understanding and the student's learning, and should resemble a natural conversation between the lecturer and the students, involving high levels of interaction. Technology such as IWB currently plays a crucial role in higher education, since it is an interactive, visual medium that can help students by illustrating points with graphics, pictures and models. IWB can also act as a Human Input device (HID), hence its adoption by the University of Dundee's department of Economics Studies in 2009. Consequently, the fundamental aim of this study is to critically examine and evaluate the effectiveness of technology such as IWB in teaching in higher education and investigate its future implications.

The main goal of this paper is to study the plan drawn up by the Department of Economic Studies and assess the available options to make an informed financial and policy decision

regarding the introduction of IWB in high education. In addition this study critically examines and evaluates the effectiveness of IWB in teaching in higher education.

LITERATURE REVIEW

Over the last ten years there has been growing interest from universities across the UK in the use of technology for supporting learning in higher education, especially now that learning is shifting from being lecturer-centred to student-centred. According to Zhang (2003), this means that there is an evolution from 'teaching by telling' to 'learning by asking or doing'. Hence Ramsden (1992) suggests that teaching should facilitate student learning by promoting a deep understanding of the subject and developing the ability to critique concepts. By its nature, therefore, economics is more interesting when students are able to express their opinions and challenge points of view, something made possible in a large group by using IWB (Biggs, 2003). This is what promoted the Department of Economic Studies at the University of Dundee to invest in technology that will economically facilitate efficient teaching and learning, as suggested by Catherall (2005). All staff members in the Department of Economic Studies felt that, with rising numbers of students and shrinking numbers of lecturers due to financial constraints, it was vital to adopt technology which would facilitate teaching and learning to both staff and students as both class turnout and interaction was becoming a challenge. Hence both lecturers and students are extremely happy with the introduction of IWB (Glover and Miller, 2001; Dostal, 2009).

Interactive Whiteboard is a large interactive display that connects to a computer and projector. A projector beams the computer's desktop onto the board's surface, where users control the computer using a pen, finger, stylus and other devices. IWB is used in a variety of settings, including classrooms at all levels of the department. The uses for IWB include operating any software that is connected to Personal Computer (PC), including web-browsers; using software to capture notes written on a whiteboard or graphics tablet; online whiteboard; controlling the PC for click and drag; mark up for annotating a programme or presentation and translating cursive writing to text; and providing an integrated Audience Response System so presenters can carry out polls and quizzes then capture the feedback on the IWB (Glover and Miller, 2001; Dostal, 2009).

The IWB is connected to a computer through a wired medium such as USB or a serial port cable, or via a wireless connection such as Bluetooth or the more secure 2.4 GHz wireless. Driver software is usually installed onto the attached computer where it enables the IWB to act as a Human Input Device (HID), like a mouse. An image is then projected onto the IWB surface from a digital projector connected to the host computer's video output. The user can

calibrate the system if necessary, then active programmes, buttons and menus as they would with a mouse (Painter et al, 2005). For any necessary text input the user can either invoke an on-screen keyboard or utilise handwriting recognition, circumventing the need to return to the computer. The combination of mouse and keyboard emulating allows the user to control the display almost exclusively from the IWB, maximising interaction opportunities. Most IWBs are supplied with software providing tools and features specifically designed to enhance their use. For example, our IWB has the ability to create virtual versions of traditional teaching tools such as rulers, protractors and compasses. Interaction between the user and the content projected onto the IWB primarily takes the form of a digital pen or stylus (Electromagnetic), a finger or other form of token pen (Resistive), or IR scan (IR Touch) (Thomas and Cutrim Schmid, 2010).

IWB will be used in the Department of Economic Studies as a replacement for traditional whiteboards or flipcharts, or video/media system such as DVD player and Television combination. The thirty staff members who will be using the IWB throughout the week can also connects to a department digital video distribution network, as well as utilising online shared annotation and drawing environments in the form of interactive rector-based graphical websites. It is important to note that there are now several studies showing the effect of IWBs on student learning. For example, studies by Glover and Miller (2001) and Glover et al (2005) found that teachers and lecturers most often used IWBs as an aid to efficiency, as an extension device, or as a transformative device. The IWB in the Department of Economic Studies will be used in all three ways to support teaching and learning. The software supplied with IWBs is critical because it enables lecturers to keep notes and annotations as an electronic file for later distribution. Furthermore, the IWB enables lecturers to record their instruction as digital video files and post the material for subsequent review by students. It is assumed that this can be very effective strategy for students who benefit from repetition, need to see the material again or have been absent, for struggling learners and for review for examinations. Other benefits are that these instructional blocks can be recorded for review by students, allowing them to see and hear the exact presentation that occurred in the classroom. This is as a result expected to transform learning and instruction (Thomas, 2010).

METHODOLOGY

The members of the Department of Economic Studies formulated and designed the questions used to evaluate this project, and the university's top decision makers also wanted to examine how the department's participation in creating technology-based learning would affect the standard of lecturing. As economics is more interesting when the level of

interaction is high, especially in large group teaching situations, IWB was found to be the ideal technology for this particular project (Collier, 1985).

This qualitative study explored the effectiveness of IWB in teaching and learning in higher education. Two questionnaires were used as a means of collecting data, the reason being that they are reliable, unambiguous, uniformly workable, easy to administer, cheap and fast, according to Anderson (1998) and Altrichter et al (2008). In addition, Cohen and Manion (1994) suggest that questionnaires contain fewer errors from research participants because their participation is voluntary and they are also engaged in their areas of interest, thus encouraging them to cooperate and eliciting answers as close as possible to the truth. In addition, group interview was used. This is seen as a conversation with a purpose where the researcher's aim is to obtain knowledge about the respondent's world. This method is also popular because it advocates the establishment of trust and commitment, something that is regarded as a prerequisite because it enables the researcher to explore the inner world of the respondents, as noted by Fontana and Frey (1994), Fern (2001) and Thorpe and Holt (2008).

Data Collection

There were 290 participants who consisted of 260 undergraduate and 30 lecturers from the department of Economic Studies. 40 undergraduate students and 6 lecturers were the sampling units. At least this represents 15 percent of the total target population. The data was collected using questionnaires and group interviews, in addition to self-reflection by the researcher. The group interviews involved at least 6 people per each group. The researchers facilitated the focus group interviews.

Data Analysis

The data was analysed using Qualitative Data Analysis (QDA), in which the data collected using questionnaires and group interviews was transformed into some form of explanation of the respondents' views on the effectiveness of E-learning in teaching and learning in higher education (Seidel, 1998). As suggested by Seidel and Kelle (1995), the process of QDA involves coding and writing. In this case the researchers looked into themes by identifying passages of text and applying labels to them that indicated some thematic idea. This labelling or coding of themes enabled the researcher to quickly retrieve all the texts that were associated with a particular thematic idea, and examine and compare them. Using Seidel's (1998) model, the researcher divided the model into three parts, namely Noticing, Collecting and Thinking about interesting things. These parts are interlinked and cyclical. As suggested by Seidel, the researcher noticed interesting things in the data and assigned 'codes' to them, based on the topic or theme as shown in the findings section, and these

codes were in turn used to break the data into sections. The codes were then used to act as sorting and collection devices (Gibbs, 2002).

FINDINGS

The findings made the lecturers from the Department of Economic Studies reflect on their attitude towards the effectiveness of technology in general and IWB in particular. In brief the findings were as follows:

- *Critical to the recollection of the content of lectures*

The good thing to emerge from the students surveyed is that 95 percent of them believe that IWB is critical to learning because it helps them to recollect the content of lectures, since the IWB enables lecturers to record their instruction as digital video files and post the material for subsequent review by students.

- *Students have access to the main concepts of the lecture*

90 percent of the lecturers agreed that students have access to the main concepts of the lecture, regardless of their note-taking ability or language proficiency; it is easy to be certain that the lecture has been covered.

- *significant to students with disability*

As discussed above this is more useful if students miss lectures through illness but mostly if they have a disability affecting their ability to take notes.

- *Encourages attendance by students*

In fact, the attendance registers show some rise in student attendance, which is attributed to the interactive learning resulting from IWB. This is exciting and significant for teachers and lecturers in that it gives students a sense of ownership of the lecture. As suggested by Biggs and Tang (2007) and Munyoro (2014), students tend to learn better when they feel free to move in an orderly manner in the classroom and are trusted, in addition to making decisions and taking responsibility for their own learning.

- *Can help lecturers to elucidate complex issues*

All students felt that IWB helps them to catch up on any missed sessions but most importantly helps lecturers to clarify certain information. Furthermore, the Department of Economic Studies' IWB provides an integrated classroom response system, which takes the form of handheld 'clickers' operating via Infrared or Radio signals. Simple clickers offer

basic multiple choice and polling options, while more sophisticated clickers offer text and numeric responses and export an analysis of student performance for subsequent review.

- *Efficient and effective in the delivering of a lecture*

All lecturers found IWB to be efficient and effective because it provides diagrams, figures and tables that would take a long time to write onto traditional whiteboards, as well as assisting the distribution of lecture materials. With classroom response and IWB systems combined, lecturers can present material and receive feedback from students in order to direct instruction more effectively, and for this reason it is also well-liked by lecturers (Smith et al, 2005).

- *The IWB improves lecturer's teaching skills*

The findings showed that IWB has an impact on teaching, improving skills by allowing lecturers to integrate active learning. IWB systems together with lecturers can present material and receive feedback from students in order to direct instruction more effectively.

Implications for the future

Although IWB is significant to the effective delivering of lectures, it is equally important to note that the regular use of permanent markers and dry-erase markers creates problems on some IWBs, because their surfaces are most often melamine, a porous, painted material that may absorb marker ink. Punctures, dents and other forms of damage are also a risk, hence suggestions that the long term goal of reducing costs might be cancelled out by the need to refurbish or replace equipment (Smith et al, 2005). In addition, some critics feel that although IWBs involve students, it is possible that some lecturers may resort to the old method of 'teacher speaks whilst students listen' and rush through their notes from the IWB (Lowman, 1988), contrary to the modern teaching strategy of involving students. Nevertheless, the department plans to introduce more IWBs by the end of 2014 as a result of encouraging responses from both lecturers and students. In fact, the attendance registers show some rise in student attendance, which is attributed to the interactive learning resulting from IWB.

CONCLUSION

It is clear that universities must cut costs, as well as investing in new technologies that, when used properly, will save money and enhance both teaching and learning. Critics feel that while technology in general and interactive whiteboard in particular is significant in teaching, it must not comprise the current high standard of lecturing. Indeed, the main criticism of IWB is that it might lock lecturers into a 19th century style of instruction counter

to the more collaborative small-group models that many education reformers favour. That said, however, more IWBs are likely to be installed by late 2014 as a result of positive feedback from both lecturers and students.

Ethical approval

The study was approved by the Department of Economic Studies, University of Dundee and the head of the department gave written permission for the distribution of questionnaires and group interview (Anderson and Arsenault, 1998; Altrichter et al, 2008). At the same time the participants received a verbal explanation about the study before they were invited to take part. Participants were assured that their involvement was voluntary and that they had the right to refuse to participate, as suggested by Cohen and Manion (1995). Furthermore, participants were given surety that anonymity and confidentiality were guaranteed in any publication of the results.

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