E-learning: IT Competencies, computer literacy and student attitudes to e-learning

Introduction

E-learning is a relatively new concept which describes learning experiences that are facilitated by digital media such as computers, web pages, video conference systems and CD Roms (Keller and Cerenud, 2002). Within Higher Education a great interest into these technologies exists, particularly with regards to the potential that the Virtual Learning Environment or VLE web-based resources offer to learning and teaching (Williams, 2002). As a result, the use of the e-learning environment in its different forms is currently being assessed within Higher Education Institutions. The 4 main forms of e-learning utilised are online courses, intranets, websites and Computer Mediated Communication (CMC) (Williams, 2002).

It is asserted that VLEs improve student achievement and attitudes towards learning Piccoli et al. 2001). The reasons suggested for this are:

- VLE learning is self-paced and thus the pace of work is determined by each individual.
- Students are able to stop, reflect and repeat any of the learning activities to aid retention.
- Learning is student-centred.
- Opportunities for tutor/student interaction are increased.
- Geographical, material and time barriers that exist in the traditional classroom are eliminated.

(Adapted from Piccoli et al. 2001 and Clark, 2002)

In 1997, Velsmid (1997 cited Newlin and Wang, 2002) discovered that over 400 colleges in the USA supplemented their traditional forms of learning with web-based instruction. Since then, its use within Higher Education in the USA and undoubtedly in the UK has most certainly seen a considerable increase. Despite this apparent explosion of VLEs there has been very little related pedagogical research to date and

as a result there is genuine concern that further developments will be led by technology rather than pedagogy (Newlin and Wang, 2002).

As yet there does not seem to be agreed criteria regarding what makes an e-learning experience effective for those involved (Steeples, 1996; Blass and Davis, 2003). Minansian-Batmanian (2002) has produced a set of 'guidelines for developing an online strategy for a subject'. The identification of the target group in terms of computer expertise, access to technology and likely motivation levels is thought to be instrumental in determining success. A review by Williams (2002) proposes that the 3 main issues that should be considered when implementing any electronic learning resource are:

1. Pedagogy
2. Participation
3. Access

Fisher (2000) identified an urgent need for further research into how e-learning should be implemented and more recently Blass and Davis (2003) suggested that "*e-learning may not be the apparent panacea*" to improving the quality of learning and teaching as was first thought.

This paper aims to examine three specific areas related to the implementation of e-learning in a Higher Education setting:

1. Computer Literacy – Do students believe that they have the necessary knowledge and skills to use the technology?
2. Computer Experience – To what extent have students entering a Higher Education Institution used computers and related technology?
3. Student perceptions of e-learning – Do students enjoy using the technology and do they feel that they learn by using it?

Computer Literacy

There is an abundance of definitions of computer literacy; however, as yet a globally accepted definition has not been established. Criteria of computer literacy have

included computer awareness, competency with software applications and programming ability (Kay, 1990).

Bradley (1996 cited Reid, 1997) introduced an alternative method of describing computer literacy levels at the University of South Australia. Four types of computer user have been identified: the emergent user, the progressive user, the high user, and the dependent user. Each definition describes a different set of behaviours such as range of software use, frequency of use and reliance on use. The characteristics of an emergent user are as follows:

- Has access to computer(s) at home or work.
- Has access to, and knows how to use word processing, email and web browsing software through designated University machines.
- Can download information to diskette for printing elsewhere.

(Bradley 1996 cited Reid, 1997)

The Department for Education in the United States of America (1996, cited Sweaney et al. 2001) has taken the skills based definitions one step further. It is stated that in addition to knowing how to use the computer for word processing, spreadsheets and Internet access, the term computer literacy describes the utilisation of the increased learning opportunities provided by such technology.

It is suggested that only a limited understanding exists of the underlying explanation for individual differences in computer literacy (Woodrow, 1991). Underwood et al. (1994) reviewed a number of studies which have endeavoured to establish the determinants of computer literacy. Many of the studies produce contradictory findings with regards to demographic variables such as gender and age. The finding that is most commonly reported to effect computer literacy and attitudes to computers is previous computer experience (Underwood et al. 1994).

Kay (1990) suggests that an individual's locus of control plays a role in determining computer literacy. The term locus of control is used to describe the degree of control which an individual believes he/she has over a particular situation (Kay, 1990). It is asserted that an individual with an internal locus of control will put more effort into

using computers, as they believe they will achieve something. A study revealed a positive correlation between high computer literacy scores and internal locus of control. However, it is impossible to establish the nature of this relationship – does high computer literacy contribute to an internal locus of control or vice versa? (Kay, 1990). Furthermore, Woodrow (1994) found that locus of control could not be accurately used to predict computer literacy but seemed to play a role in determining computer attitudes. Computer anxiety is a factor that has been found to affect the ability to engage with Information Technology and may well be related to an external locus of control and poor computer attitude (Reid, 1997).

A study by Smith and Necessary (1996) investigated the computer literacy levels of undergraduate students at Ball State College, Indiana. Demographic factors including gender, computer ownership, and computer experience were considered.
They found that the primary determinant for higher scores on the Computer Ability Survey designed by Kay (1993) was experience with computers. It is also suggested that previous inferences about gender differences and computer literacy may in fact be due to females having less computer-related experience and not gender itself.

Canning (2000 cited Blass and Davis, 2003) reported a number of competence based reasons for high student dropout rates in the e-learning environment. Fifteen percent of students identified their need for more training with technology, 10% required greater technical support and 12% said that the technology was simply too difficult to use. Student's themselves are reporting that computer competence has a significant effect upon e-learning participation (Alexander, 2001). It therefore seems crucial that adequate technical support is provided for those students using a VLE.

During the design stage of the VLE it is essential that any assumptions made about the abilities and skills of potential users are correct (Minasian-Batmanian, 2002). The technical competence of students who will be using the virtual learning environment must be assessed in order to determine their ability to use the resource effectively (Blass and Davis, 2003). An evident need has been identified for student's to receive training on how to use the VLE and time to practice before any summative assessment occurs (Williams, 2002). Furthermore, Naidu, Barrett and Olsen (2000)

report that any preparatory training should focus upon the specific needs of the potential VLE users with variable levels of guidance available.

The majority of studies into students' computer literacy have utilised a form of self-assessment survey. Larres et al. (2003) voiced concern over the appropriateness of self-assessment tests and the information that can be inferred from them. It was found that students perceived computer literacy was not usually accurate when compared with actual computer literacy, with the majority of students' overestimating their ability. The results of these tests may in fact say more about the students' attitudes to computers rather than their competence with computers. Results should be treated with caution and should not form the basis of course or resource design. Self-assessment tests should be used in conjunction with more robust measures of computer literacy such as practical tests (Larres et al. 2003).

The vast majority of today's undergraduates have recognised the importance of computer literacy and realise that they will have a better chance of succeeding personally and professionally with a good knowledge of computers (Sanders and Morrison-Shetlar, 2001).

In a study by Sweaney et al. (2001) an impressive 83% of students reported that they regularly used the Internet as a research tool, yet only 56% had cited an online reference in an assignment. This finding supports the need for additional training with new learning resources.

Fisher (2000) investigated the computer skills of initial teacher education students at Pepperdine University, USA. Some 86% of participants classified themselves as experienced computer users or as having some knowledge of computer software applications. Furthermore, it is forecast that such figures will inevitably increase inline with computer usage in schools and at home.

Computer literacy among academics in Higher Education shows considerable variation yet it is assumed that all students will have a similar level of related skills on entering university (Furst-Bowe and Boger, 1995/6). Few studies have investigated

computer literacy of students entering university, however, data from Furst-Bowe and Boger, 1995/6) suggest that levels of computer literacy are variable. Sweaney et al. (2001) also recognise the need to be cautious in assuming that all students have had similar exposure to computers.

Computer Experience

Within the last few years students have encountered a rapidly changing learning environment with a dramatic rise in the e-learning resources available (Fisher, 2000). Fisher (2000) found that all students entering a university regardless of background and demographic factors have used computers at school and work and as a result are much more aufait with computers than undergraduates entering universities only a short time ago. Only a decade ago, Hamberg and Helm (1991) reported that fewer than half of Bradford University's fresher students had any experience with computers.

Frand (2000) emphasises how computer usage has changed over this period:

> *Most students entering our colleges and universities today are younger than the microcomputer, are more comfortable working on a keyboard than writing in a spiral notebook and are happier reading from computer screen than from paper in hand.*

Bradlow et al. (2002) suggest that in addition to increased computer experience at an earlier age, this trend can also be attributed to the advances in software and computing power which have made computers more user friendly. It may be that a lower level of knowledge is now required to successfully utilise computer applications.

This finding is supported by a study into the computer experience and skills of family and consumer science undergraduates and professionals in Georgia carried out by Sweaney et al. (2001). An impressive majority of participants reported at least some computer experience, with 98% having experience of word processing. Internet use

was also common with 87% of students reporting that they were required to use the Internet for assignments.

Sanders and Morrison- Shetlar (2001) reported similar figures, with 98% of participants having some and 78% having a moderate or large amount of computer experience.

As student's computer usage increases, the need for universities to provide stimulating learning resources in electronic format becomes more urgent as Higher Education Institutions compete for potential students (Follett, 2000 cited Lewis, 2002). Students and Higher Education have recognised the increasing demand for graduates displaying computer literacy and thus the debate over whether to introduce computers to the arena has been abandoned and replaced with the question of how they should be used (Furst-Bowe and Boger, 1995/6).

Student perceptions of e-learning

Student attitudes and thus usage are vital to securing the future of any VLE (Sanders and Morrison-Shetlar, 2001) yet there is a distinct lack of research into e-learning from the student perspective (Alexander, 2001; Keller and Cerenud, 2002).

It is claimed that students can learn more from e-learning than through traditional classroom methods, perhaps because students become more involved in the learning process through interactivity. The increased requirement of cognitive activity is thought to aid retention (Clark, 2002). The benefits of email interaction from a student's perspective have been reported by Carswell et al. (2000). Students utilising the email system had increased interaction with tutors when compared to students who relied on traditional methods of communication e.g. waiting to ask question in lecture/seminar.

A study by Sanders and Morrison-Shetlar (2001) investigated the attitudes of students in an undergraduate biology course to web-enhanced instruction. The web enhancement allowed students to:

1. Obtain the syllabus and have access to daily class events
2. Obtain outlines of course material
3. Take online quizzes to test their knowledge base throughout the course
4. Use a bulletin board and chat room
5. Link to other web sites of interest

A disappointing 8% of participants regularly used the chat room. Such a finding is reiterated by Blass and Davis (2003 p239)

> *Ask most academics about their experiences of trying to interact with students during the e-learning process, and they will tell you that they cannot get the students to use the discussion boards.*

The difficulty in getting students to participate in electronic discussion forums is also highlighted by Mason (1999 cited Williams, 2002). Light and Light (1999 cited Williams, 2002) suggest several reasons for such low participation rates:

- Students do not want their thoughts to be publicly exposed and subjected to criticism.
- Any contribution made is permanent and can not immediately be justified or explained as in face-to-face interaction.
- Student contribution may be misinterpreted without chance to justify reasoning.
- Students do not want to look stupid if their answer is wrong.
- Students are reluctant to criticise their peers.

A study by Wilson and Whitelock (1998) titled ‘A comparison of student and tutor online time across three distance learning courses’ also found very low student usage levels of the VLE but noted that these figures were inline with those reported by other institutions using similar learning tools. The difficulties in getting students to start and/or complete an e-learning activity are attributed primarily to boredom and dissatisfaction (Clark, 2002). The reasons for this are often because the intended e-learning experience is merely a reading experience whereby existing course materials are put into electronic format (Blass and Davis, 2003).

A study by Keller and Cernerud (2002) examined the e-learning experience from the student perspective. Specifically, attitudes towards and experiences of e-learning used as a supplement to traditional lectures and seminars were explored. The study took place at Jonkoping University in Sweden and involved approximately 3000 students from the School of Engineering and the School of Health Sciences. Both schools had access to a noticeboard, the library, functions for course participants and a discussion forum on the web platform.

In general, student's perceptions of e-learning were disappointing with more than two thirds of participants disagreeing that the web platform had:

- Facilitated their learning.
- Improved communication with students or lecturers
- Improved pedagogic value of course
- Improved their possibilities to solve course-related problems.

The study also revealed that the implementation strategy of a VLE is a key determinant in influencing student's perceptions. Furthermore the differences in implementation between the two schools were more influential than individual differences including computer experience.

Alexander (2001) also acknowledges the diversity of student e-learning experiences as a result of the range of e-learning resources used by different universities and within universities themselves. Despite the complexity of analysing student perception to e-learning as a whole, several key determinants of student satisfaction have been identified. E.g.

- If e-learning activity is not summative students tend not to participate (Alexander, 2001; Williams, 2002).
- VLEs which are user friendly and engaging are best received and utilised (Sambrook, 2001).
- Students should be provided with opportunities for explanation and clarification of the content of the VLE (Blass and Davis, 2003).

Despite increased usage of computers by today's students, many have showed great resistance to the change in learning environment, stating that they much prefer the

traditional lecture format to the VLE (Alexander, 2001). The findings from a study by Piccoli et al. (2001) titled 'Web-based Virtual Learning Environments: A Research Framework and a preliminary assessment of effectiveness in basic IT skills training' reaffirm the reluctance of students to adopt the higher degree of self-responsibility required by the VLE. Students expressed concern over the level of control they were expected to have over their own learning. This is highlighted by several comments including "*students should not be responsible for also being teachers*" and *"I have never taken a class like this"* (Piccoli et al. 2001 p419).

The change to a VLE involves a major cultural shift in epistemological values and pedagogy, as students are expected to familiarise themselves with the new "netiquette" of virtual communication (Carswell, 2000). Participants have reported experiencing frustration with having to wait 24 hours or more for responses to queries and comments (Naidu, Barrett and Olsen, 2000). A common complaint about the VLE from students is the increased demand for them to be active in their learning (Williams, 2002). In other words students have to work harder in the VLE than when merely receiving information in a lecture. Those students who have only basic computer literacy have described the VLE mode of delivery as a "source of much anxiety" (Naidu, Barrett and Olsen, 2000 p118). In addition to anxiety and frustration, Piccoli et al. (2001) note that students report feelings of isolation, confusion and reduced interest in subject matter. However, it is likely that as students become more familiar with a VLE their learning strategies will be modified in response (Piccoli et al. 2001).

In contrast, Newlin and Wang (2002) reported much higher usage and positive feedback by students of the chatrooms than other components of the web platform. Students found that the chat room provided an opportunity for peer interaction without the geographical and time constraints of traditional lectures and seminars (Naidu, Barrett and Olsen, 2000).

Similar findings were reported by Naidu, Barrett and Olson (2000). Once students had got used to the new medium they showed appreciation for it's flexibility in terms of

location, pace and time of study. General feeling among students was that the VLE provided a more time-efficient and thorough alternative.

Lecturers have found that the quantity and quality of student input to online seminars which *were* well attended were more "interesting, informed and provocative" in comparison to traditional classroom-based seminars (Blass and Davis, 2003 p241). It is therefore suggested that when designing the VLE chat rooms should aim to be areas of the web platform which students will feel comfortable using and enjoy using (Sanders and Morrison-Shetlar, 2001).

Williams (2002) provides the following guidelines which should be followed when designing a VLE:

- Website must be easy to look at and simple to navigate.
- Information should be clear, concise and limited in quantity. Students should not be overwhelmed.
- Complex graphics and images should be avoided. The downloading of these can be very slow and thus frustrating.
- Pages should be printable

Conclusions

Student perceptions of the e-learning experience are not as positive as one may think. It is evident that the e-learning experience requires further investigation before it becomes any more widely used in Higher Education. E-learning should not be used for the sake of using e-learning. Instead, only suitable activities identified by studies of best practice should utilise the technology. Participation by students is essential and thus their co-operation needs to be guaranteed. At present participation seems to be primarily dependent upon whether the e-learning activity is assessed.

It seems that computer experience and computer literacy play a key role in determining the success of a VLE and thus the computer skills of potential users must be taken into account. The accuracy of self-assessment computer literacy tests is

questioned yet the viability of testing each student with practical tests is also problematic.

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