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AMCIS 2001 Proceedings

Americas Conference on Information Systems (AMCIS)

December 2001

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Abstract

This paper explores three aspects of online education on campus: technology usefulness, social interaction and learning outcomes. The empirical findings of this exploratory study suggest that online technology offers educators promising opportunities for fostering an effective collaborative learning environment in traditional universities. Students reported that the online system was useful for studying, helped them form friendships with others, and enhanced their overall quality of learning. We recommend more studies to examine the potential and the implications of implementing online learning technology on campus in the future.

Keywords: Online education, collaborative learning, educational technology, computer-mediate learning, technology usefulness

Introduction

The introduction of information communication technology (ICT) has benefited numerous organisations in enhancing productivity, achieving better workflow management and obtaining competitive advantage. Apart from its value for organisational performance, the potential of ICT to improve the learning process has, in the past few years, begun to generate strong interest from researchers and practitioners in the field of education and information systems. With the widespread use of the Internet, coupled with the decreasing costs of computer hardware/software, both distance and traditional universities, such as the University of Phoenix, the University of Pennsylvania and the U.K. Open University, are now offering web-based courses or programmes. Some universities have even formed alliances to deliver education through the Internet; UNext.com is one example. As a result, commentators nowadays style this growing phenomenon e-learning or online education. Online education shares characteristics with both distance and conventional campus education. The former is known for two distinct elements: the physical separation of teachers and students; and the use of technical media to connect them (Keegan 1980). The technical media are credited for their ability to stimulate the cognitive and affective interaction that enhances learning outcomes. From our perspective, online education is a hybrid of these two forms of education. It not only has components ascribed to distance education, but also the capability of extending interactive activities taking place on campus beyond time and space boundaries (Harasim 1989).

Collaborative Learning and Computer-Mediated Communication

The rise of online education springs from the increasing significance of collaborative learning and the innovation of computer-mediated communication (CMC). Collaborative learning is a method of teaching that has evolved to challenge the traditional behaviourist approach. The behaviourist approach, which subscribes to the philosophy of objectivism, believes in a single reality and absolute knowledge. Consequently the design of instructional strategy is to set a discrete learning goal and identify a series of required behaviours for performance. In contrast, the premise of collaborative learning relies on the philosophy of social constructivism. This branch of philosophy recognises the existence of multiple realities and denies the notion of absolute knowledge, arguing instead that knowledge construction is a social product achieved through the process of interaction with one's prior experiences and with other people in a social-cultural context. Accordingly, collaborative learning posits the view that a better quality of learning ensues when, as a group, students work and interact with each other towards a shared goal. It stresses

that the ongoing process of discussion, negotiation, reflection and collaboration in a group has a significant effect on the development of higher-order and critical thinking (Sullivan 1996).

The goal of learning through group interaction is hard to realise when there is a separation between (among) teachers and students. However, the advent of CMC has changed the outlook of collaborative learning at distance. CMC mainly refers to the asynchronous and text-based exchange of information among people through networks of computers. It allows geographically dispersed groups to communicate and form a community. Therefore, channelling both one-to-many and many-to-many communication through computer conferencing is ideal for facilitating group interaction in a collaborative learning environment (Garrison 1997, Jonassen, *et al.* 1995). Asynchronous communication and easy access to the system can extend group learning opportunities across time and geographical boundaries. Hence students are able to discuss and socialise with each other, or with a teacher, when and where they choose. In short, the online system provides a vision for transforming the educational process by the creation of virtual learning spaces (Leidner and Jarvenpaa 1995).

The purpose of this study is to explore three main issues of online collaborative learning: the usefulness of technology, social interaction and learning outcomes. The first element deals with student views towards online technology. A number of studies have demonstrated that, when responding to a new technology, the perceived usefulness has a significant impact on users' attitude and hence on consequent behaviours (Davis 1993, Davis 1989, Hu, *et al.* 1999). We want to find out whether students on campus find online learning technology useful and in what aspects. Social interaction is one of key elements in collaborative learning. Some commentators put the argument that, in comparison with face-to-face settings, online communities face problems of uninhibited behaviours and have more difficulties of forming friendships (Siegel, *et al.* 1986, Sproull and Kiesler 1991). Here, we would like to investigate this matter further. Finally, we also intend to explore the ability of online technology to facilitate the development of students' higher-order and critical thinking skills.

Research Background and Methodology

This is an exploratory case study utilising both quantitative and qualitative methods to examine the three issues mentioned above.

The subjects under this study were graduate students studying Information Systems at a traditional university in the U.K. The online course was one of the optional courses from which students choose in the second term of their 12-month programme. There were 36 students registered for the course. The average age of students was 28 with mixed nationalities from Asia, North America and Europe. Only two students had previous online education experience. All students were computer literate and a majority of them had an Internet connection in their student accommodation. The web-based technology used in this study was WebCT, an off-the-shelf distance learning software.

Over the course of 10 weeks, participants in this case study pursued their studies using the online learning environment, with the opportunity of also attending a face-to-face lecture once per week. Online they participated in class discussions, worked on a group project, communicated with teachers and fellow students, and obtained reading material. Face-to-face lectures were also recorded and made available to students online so that they also had a choice of both attending the physical lecture and listening to it through the Internet.

With regards to research methods, we adopted three techniques: questionnaire, semi-structured interviews and online activities observation. We constructed survey items under three categories: technology usefulness, social interaction and learning outcomes. In order to maintain a level of validity, we mostly drew upon the existing survey variables in educational research instead of inventing new ones, as suggested by others (Leidner and Javenpaa 1995, Webster and Hackley 1997). For technology usefulness, we made modifications on items initially developed for the technology acceptance model (Davis 1993, Davis 1989). Although TAM tends to link with an organisational focus, many TAM studies have used students as subject group (Mathieson 1991, Davis et al 1993). Hence within certain limitation we consider adopting part of the TAM survey items appropriate for this study. For social interaction, we modified items based on group interaction and collaborative learning theory (Bales 1999, Johnson and Johnson 1987). Lastly, measures for learning outcomes came from Hiltz's work on collaborative learning through ALN (Hiltz 2000, Alavi 1994). Items under both these latter categories have been used for educational research. A five-point Likert-type scale was adopted to measure all items, with 1= Strongly Agree (SA) to 5 = Strongly Disagree (SD). Before handing out to all students, we first tested the questionnaire with a small number of students with the purpose of checking their understanding on the wording of the questionnaire itself to ensure validity. Owing to the small sample size, we realised that it is difficult to provide valid and reliable information about these three aspects of online learning. Therefore, in order to enhance the quality of this research and as further sources of information, we also carried out 20 semi-structured interviews and recorded online activities.

Our quantitative analysis was performed with the aid of STATA software but we did not consider it necessary to use software to assist our qualitative data gathering.

Research Findings

The findings of the study are organised in three subsections. In each section, we first offer a summary of the questionnaire, some results of performing t-test and then present further supporting evidence from interviews or students' online activities.

Usefulness of Online Technology

Within the category of usefulness, seven questions were asked. As the table below showed, in general students considered the system as a very useful learning tool. In particular, there is a strong significance ($\alpha = .05$) of agreement that the system made it easier to study, enabled them to have greater control over their study, and to reach people with whom they needed to communicate. Students regarded the most useful feature of the online system to be that it provided leads, references, and useful information related to the course.

Table 1. Usefulness of Online Technology

Survey Items	Mean	S.D
Easier to Reach People	1.80	0.45
Useful Information	1.25	0.5
Efficiency of study	2.43	0.75
Quality of study	2.50	0.58
Control over study	1.79	0.49
Easier to study	1.55	0.6
Overall usefulness	2.00	0.82

This view of the usefulness of the system was also reflected in the online communication flow and interview results. The log file of the system showed that on average there were about 13-15 daily accesses from students. In addition, of 587 messages generated over the period of 10 weeks, students contributed 417 messages (71.04%) while teachers only sent out 170 (28.96%) messages. Most messages served the purpose of reading information exchange or communication. Students further explained:

> " I think that this (the online learning) is good for Masters students. Since we have a certain level of maturity compared with undergraduate students, this system does allow you to have such great deal of flexibility in terms of your working schedule, especially, for those who are working professionally at the same time." HM
>
> "I would say it is more effective and helps to keep you on the right track. Everything is there, you don't have to spend a lot of time in the library by yourself. " SV
>
> "This is so accessible and you do it whenever you want. It also helps me to structure my studying which I haven't done for my undergraduate study. However, I am not sure whether there is a need for this for my first degree." NS

Social Interaction

In the category of social interaction, we are interested in whether students in the online environment consider each other as friends and recognise the existence of the group. According to the survey results, it appeared that in general students had a positive attitude towards other fellow students communicating through the system. For instance, they would support their online discussion group members and felt that they could depend on other members of the group.

Table 2. Social Interaction in the Online Learning Environment

Survey Items	Mean	S.D
Cooperation	2.47	0.47
Friendship	2.25	0.5
Depend on each other	2.27	0.87
Support	2.13	0.53
Work as a team	2.20	0.45

They provided explanations such as:

> "I also found that the fellow students are participating very actively, they will answer my comment. I thought that it was quite interactive, I feel encouraged and started feeling enthusiastic about it. I did enjoy communicating with them." JC

> "we also created a network that we might not have created without having this online, because you could answer people." HF

> "It is funny to feel that I had more interaction and was more comfortable with my classmates in the online discussion than my other face-to-face classmates. In a way, I felt that I talked to them more. Also, it helps to develop off-line friendship." SB

Moreover, our analysis of the messages exchanged among students also identified the development of friendships online. We noticed that the style of writing was formal and stiff at the beginning but, gradually the writing grew to be more informal - messages became more frequent and shorter. There were increasing numbers of jokes or humour embedded in the messages and more use of symbols representing missing physical cues. However, there is no indication of uninhibited behaviours taking place in this particular case.

Learning outcomes

In this category, we examine the effectiveness of the online learning system. Of the questions asked in this section, the results show that there is a significant agreement ($\alpha = .05$) particularly on three benefits of the system as compared with other face-to-face courses being taken at the same time, namely

1. The online system helped them increase their critical thinking skills;
2. The online system helped them to learn factual material;
3. The online system helped them to think for themselves.

Table 3. Online Learning Outcomes

Survey Items	Mean	S.D
Ability to critical thinking	1.97	0.89
Integrate facts	2.47	0.97
Analytical skill	2.20	1.06
Confidence	2.27	0.94
Value other viewpoint	2.43	0.86
Interrelate ideas	2.67	1.06
Understanding concepts	2.30	0.99
Factual materials	2.13	0.73
Identify central issues	2.27	0.87
Interest of discussion	2.53	1.2
Additional reading	2.37	1.13
Do some thinking	2.03	0.81

In addition, teachers indicated that in their view and experience, online students appeared better at incorporating the old and new knowledge together in a discussion than face-to-face students. This statement was consistent with the analysis of online messages that found online discussions among students to be very thorough and analytical. A number of students described how the system helped their process of knowledge development.=

> " The greatest benefit I got from the online learning environment was the wide variety of schools of thoughts that I can read and discuss. The online form allows me to have sufficient time to think, to reflect, and to put my well-organised arguments." HM
>
> "The online learning system has been very helpful in increasing my understanding of basic principles, as well as widening the breadth of my reading." JD
>
> "The level of knowledge accumulation over time is higher than in other courses. In this course, you are forced to accumulate knowledge little by little at different stages. Yes, I think that I learnt more. I wish that I could have this for all my courses." PF
>
> "I used to think learning most of time is very individual, but this (online learning) changes it. It is more like group learning. I mean not just from reading, but from other people as well." SB

Discussion

Before embarking on a discussion of the findings of this exploratory study it is appropriate to underline the dangers of generalising too much from such a small sample. As an exploratory study, the aim was to investigate the three issues in a manner designed to refine tools and techniques for further research. What follows as findings can only reflect this highly bounded scope. When the online learning work moves into its operational phase the researchers will have much larger samples on which to apply the instrument developed in the exploratory phase. As for the content of the measuring instrument it would be true to say that the adoption of tools used in slightly different contexts can always be criticised as eclectic and lacking in rigour. In addition to the discussion on this topic in the earlier section, it can be added however that there is no single correct method for developing research techniques and that improvisation and inventiveness must also have their place in a creative research environment.

The findings in the preceding section reveal some interesting insights into the online learning environment in terms of usefulness, social interaction, and consequent learning outcomes. First, students overall considered online technology as a useful tool for facilitating their learning. Their opinions on the usefulness of this technology were reflected in the heavy use of this system over the period of 10 weeks, and in the expression of willingness and confidence to participate in online courses in the future. In the students' view, the online learning environment was a combination of lecture materials, libraries and classes and with no time or space restrictions on access. Flexibility and making easier the study process resulted as the main reasons behind the usefulness. An interesting finding from the interviews is that the degree of usefulness of online technology for students seems to be governed by the educational level of study. Many students felt that the system was useful for a masters degree, but would have been less had they been studying for a first degree. This seems to support the view of Moore (1972): that when there is a separation of dialogue between teachers and students, the greater student autonomy, the better student performance. The degree of autonomy tends to relate positively with age. Accordingly, we speculated that mature students are more likely to be in control of their study without constant supervision from the teacher, and hence they should find the online learning system more useful than undergraduate students who tend to reply on directions from instructors. However, further studies are required to examine the possible differences in perception of usefulness of online systems by masters students as compared with undergraduate students.

Secondly, as mentioned earlier, social interaction is another key component of collaborative learning. Hilt and Wellman (1997) argued that compared with face-to-face situation it is more difficult to form and maintain friendships through CMC. The findings of this study do not reach the same conclusion. In contrast, students in this case study suggested that they bonded with their online classmates more than those in physical classes. In a closer scrutiny, students in this university do not have a big campus due to its location in the city. Most of them live somewhere distant from the school. Therefore, students normally had a chance of seeing each other face-to-face once or twice per week in the classroom or lecture hall, and most of them often did not stay at school since majority had other commitments other than school. One student told us that " without this system, I would probably just come to the lecture and then leave without knowing my classmates. Now, I felt more part of this course and would talk them after lecture if I attend." Consequently, the difficulty of developing friendship face-to-face might lead to students be more socially interactive online. They see the advantages of flexible and asynchronous access of the online system allowing them to form a learning community on campus. Harasim (1989) points out that online education can extend the affective interaction on campus, her view

is supported by our findings here. Although our preliminary findings suggest that positive social interaction can take place, we suggest that other elements (e.g. instructor's influence or group size) are needed to be taken into account in the future research.

Our results on learning outcomes are fairly consistent with other studies on this subject(Alavi 1994, Benbunan-Fich and Hiltz 1999, Dejnaronk 2000). According to the students' own reflections on their critical thinking skills development in comparison with other face-to-face courses, they were very positive about knowledge acquired through the online medium. Most students suggested that online learning environment provided them an opportunity to discuss and debate with their peers on a particular topic for a longer time limit. In this situation of conventional classes, given the time constraint, sometimes it can be difficult to cover all topics or complete certain discussions. Besides the face-to-face educational delivery is still fairly didactic with the teacher in control of communication pace and flow. In contrast, online conference tool offers a flatter discussion structure and the role of teacher becomes a facilitator instead of an instructor. In this sense, students become active creators instead of passive receivers of knowledge. Discussion content is also retrievable so that students can always review others' comments and reply at their won choice of time and space. Consequently, compared with face-to-face discussion, students can engage a discussion and articulate their thoughts under less time pressure. Furthermore, receiving feedback from others online promote students to carry out further research or to think, and hence again stimulate the process of learning. Interestingly, students suggest that the best discussion environment would be the combination of occasional face-to-face classes coupled with continuous online discussion. Face-to-face class discussion can offer the benefit of immediacy which can be lacking in asynchronous discussion environment. The purpose of collaborative learning is to promote knowledge construction through group discussion, debate and reflection. On this account, it seems the implementation of online education on campus meets such purpose better than just purely face-to-face classes.

Limitations and Future Research

This empirical study is exploratory and has some limitations. One limitation was the lack of comparison with face-to-face groups; we were not able to spilt students taken this course into two groups of online and face-to-face. We tried to use comparative survey questions to overcome this limitation, for example, most survey items started with the sentence of "compared with your other face-to-face courses." Another limitation was the timing of the online course. Students took this course in the second term of their study, that meant that some of them might have become acquainted before taking this course. This might introduce certain biases on the value of the online system in community building. In addition, as stated earlier, we recognise that there is a limitation of generalisability from this study considering the small sample size. Our results can provide initial insights into potentials of online education on campus. However, we understand the need to replicate the study in the future in order to increase the external validity of the current findings.

For future research, we suggest that further studies can take other issues such as instructor style, university culture, educational level and student characteristics into account on the effectiveness of online learning on campus. Furthermore, a longitudinal study could enhance our understanding to a greater extent of how students develop knowledge, use such technology, form friendships, and of the consequent impact on institutional structure.

Conclusion

As stated earlier, the aim of collaborative learning strategy is to help students construct knowledge through the process of social and intellectual interaction with others in a group setting. In this prospect, the findings of our study demonstrate that online technology is full of potential. In particular, we discover that such a system gives students more control over study, stimulates the process of community bonding, and enhances learning outcomes. However, since the nature of this study is exploratory, we suggest that further studies are necessary in order to fathom the full potential and problem of online education.

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