

Factors Affecting Student Participation in the Online Learning Environment at the Open University of Hong Kong

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Abstract

The aim of this study was to investigate the factors that affect students' participation in the online learning environment (OLE) for distance learning students of mathematics at the Open University of Hong Kong (OUHK) and to compile students suggestions to improve their use of the OLE. A questionnaire was designed to survey students' usage pattern of the OLE (called WebCT). The analysis of the results obtained from the open-ended questions in the questionnaire and the interviews revealed that students liked using the OLE for sharing and learning from each other. They also preferred to have tutorial notes and the solutions for the assignments. To improve WebCT, students suggested adding electronic submission for assignments (WebCT Campus Edition 3.6.2 was adopted at the time of doing this study), students' assignment records, Chinese character support and a mathematical science package.

Résumé

Le but de cette étude était d'explorer les facteurs qui affectent la participation des étudiants dans un environnement d'apprentissage en ligne (EAL) pour des étudiants à distance en mathématiques à l'Open Learning University of Hong Kong et de déterminer les suggestions des étudiants susceptibles d'améliorer l'utilisation du EAL. Un questionnaire a été réalisé pour sonder les profils d'utilisation des étudiants du EAL (WebCT). L'analyse des résultats obtenus à partir des questions ouvertes du questionnaire indiquent que les étudiants aiment utiliser le EAL pour partager et pour apprendre les uns des autres. Ils préféreraient aussi avoir les notes de cours et les solutions des exercices. Pour améliorer WebCT, les étudiants ont suggéré l'ajout de fonctionnalités de soumission électronique des exercices et de suivi des exercices des étudiants, des polices de caractère chinoises et un progiciel de science mathématique.

Introduction

The use of technologies for educational purposes has been available in the support of on-campus classroom teaching, online-dependent or fully online teaching mode for more than ten years (Armatas, Holt & Rice, 2003). Research suggests that the online learning environment can be

used to help distance learners, including those in mathematics courses (Keller & Cernerud, 2002; McDonald & Reushle, 2000).

The online learning environment reinforces two-way communication between tutor and students and this communication channel seems to be an appropriate way to enhance the OUHK students' learning. To establish a user-friendly and common online communication system for all students at the OUHK, WebCT was introduced six years ago. After receiving positive feedback from a half-year trial, the use of WebCT (Campus Edition 3.6.2) was formally adopted in October 1999 and its use has increased every semester since 1999. In October of 1999, WebCT was used in approximately 20% of all courses in the School of Science and Technology, and this increased to about 85% in October of the 2004 (Wong, 2004). WebCT used at OUHK could not support Chinese characters and mathematical symbols, and consisted of 14 parts: News, Course Details, Course Coordinator, Course Schedules, Course Guide, Stop Presses, Errata, Calculator List, Specimen Exam Paper, Assignment Files, Discussion Board, Chat Room, E-mail and Evaluation.

A foundation pure mathematics course, coded M121, has been offered since October of 1999 at OUHK, and the OLE was provided to mathematics students as an enhancement tool since 1999. WebCT has been used as the platform of OLE since then for M121, but the access of WebCT was optional to M121 students. Within the past few years, the statistics data generated by the WebCT system showed that only 6 - 8% of M121 students were actively involved in the discussion board (i.e., students who had posted at least ten messages in the discussion board were considered as active students) and the other 88 - 90% of them had accessed the WebCT site (Wong, 2004). The majority of M121 students however only browsed the page each academic year. A number of questions have arisen from this result. Is WebCT a helpful and convenient tool for mathematics students? What are the obstacles to students' participation in WebCT? There is a need to investigate whether WebCT is an appropriate tool for enhancing the learning mathematics for OUHK students.

Aims

The aim of this study was to evaluate WebCT and to investigate the factors that encourage or discourage students from using WebCT and what could be done to improve their use of WebCT. Therefore, the following research questions served to give direction to this study.

1. What factors do distance mathematics students perceive that encourage them to actively participate in using WebCT?
2. What factors do distance mathematics students perceive that discourage them from actively participating in WebCT?

3. What could be done to improve mathematics students' participation in WebCT?
4. What could be done to help students learn mathematics using WebCT?

Literature Review

When distance educators, such as Holmberg (1978), and Daniel and Marquis (1979) asserted the importance of a theory of interaction and communication to distance learners in the 1970s (Keegan, 1996), they did not mention the application of computers, since computers were not broadly used at that time. The development of two-way communication through the Internet or other computer networks has been a major focus of distance learning programs since the middle of the 1990s (Picciano, 2001).

The literature shows that using computers in education can be an effective way to motivate students' learning (McDonald & Reushle, 2000), as well as a way of providing flexibility of study and rich resources for students' studies (Corderoy & Cooper, 2000). The research findings also reveal that students obtain competence with technology (Daugherty & Funke, 1998), are encouraged to participate in online discussion (Siekman, 1998), prompted to communicate (Carey & Crittenden, 2000; Wernet et al., 2000), improve their performance (Cole et al., 2000; Wernet et al., 2000) and reduce their feeling of isolation (Lake, 1999). In a study about accessing counselor education, the results suggested that students' positive attitudes towards computers was highly related to students' use of computers (Hayes & Robinson III, 2000).

On the other hand, the literature also shows that using computers has grown too fast and staff at schools might not be ready to include them as an essential component of the teaching and learning process (Garcia, 1998) and that computers must be justified by their contribution to individual institutions (Owston, 1997). The literature also reveals that lack of technical support is a significant problem when using computers in teaching and learning (Selwyn et al., 2000). It is necessary to explore further those factors which influence students' use of computers in tertiary education (Selwyn et al., 2000) such as, preference for face-to-face contact rather than using technology (Morss, 1999), not enough time to read and post e-mail messages (Hofmann, 2002), lack of immediate feedback (Perdue & Valentine, 2000), fear of using technology (Duvall & Schwartz, 2000), high levels of computer anxiety (Hong & Koh, 2002), being female (Khine, 2001), having a poor attitude towards computers (Khine, 2001) and low previous computer experience (Hong & Koh, 2002). There are, then, positive and negative aspects for using computers in distance education.

Method

Sample

The target sample for this study was the students who studied a course, *A Foundation in Pure Mathematics* (coded M121) starting in October 2002 (N = 556) at OUHK. OUHK students are adults over 17 years old who possess a Hong Kong Identity Card, but no formal academic background is required. The booklet of facts and figures published by the OUHK in 2004 (The Open University of Hong Kong, 2004/05) revealed that the average age of our students was 34, and 43.7% of students were aged over 35. Many adults in this age group have full-time employment and are married. Generally, students in the OUHK come from a wide variety of educational backgrounds.

Questionnaire

A bilingual (Chinese and English) questionnaire was designed to collect the demographic characteristics of students experienced in using WebCT. To understand the reasons for students' participation or non-participation in WebCT, and how WebCT could help them learn mathematics, seven open-ended questions were designed for students to provide reasons for accessing or not accessing WebCT, for finding helpful or non-helpful items in WebCT, and for them to provide suggestions for improving the use of WebCT.

To increase the return rates, a copy of the questionnaire was sent to each of the M121 students, was distributed in their tutorials and was posted to WebCT in mid-June 2003, near the end of the course. As a result, a total of 231 valid questionnaires were returned at the end of course in July, representing a response rate of 41.5% (231 out of 556).

Of the 231 questionnaires, 17 did not provide any responses for the open-ended questions in Section B of the questionnaire. This represented 92.6% (214 out of 231) of these questionnaires used for qualitative analysis. The qualitative methods of long-table approach explained by Krueger and Casey (2000) and of constant comparison informed by Kent (2001) were followed for the analysis of the open-ended questions.

Interviews

After examining the data obtained from the questionnaire, a series of semi-structured interviews were arranged to obtain more information pertaining to those factors which encourage or discourage students from using WebCT, and their perceptions of its effectiveness in enhancing their learning of mathematics.

In order to understand the reasons for students' participation or non-participation in WebCT, potential interview participants were divided into three categories according to the frequency of their participation in WebCT. These three categories of students consisted of: those who actively participated in the Discussion Board by posting more than 10 messages (Category A), those who accessed WebCT by browsing only (Category B), and those who never accessed WebCT (Category C). Participants were divided into these three categories based on data generated by WebCT system.

Seventeen participants indicated on the questionnaire their willingness to participate in a semi-structured interview. Among these 17 participants, only 10 promised to attend the interviews and all of them belonged to Category B. It was necessary to interview the students who came from other two categories. A further 57 telephone calls were made to invite students to participate in interviews. Consequently, a total of 21 students were interviewed and a total of five individual interviews and two group interviews were arranged and six of these students were from Category A, thirteen from Category B and two from Category C.

To make sure that the interviews proceeded quietly and privately, all the interviews were held in a classroom of the OUHK or another tutorial centre. The individual interview sessions each lasted for approximately half an hour and the group interviews lasted for approximately one hour. In addition, the interviews were tape-recorded with the students' permission, for the purposes of transcription and analysis. To allow students to express themselves easily and clearly, all of the interviews were conducted in Cantonese.

Since the interviews were conducted in Cantonese, it was necessary to translate and transcribe the content of the interviews into English. Similar procedures to the clustering approach (Miles & Huberman, 1994) were adopted. This approach is similar to the method of comparison suggested by Kent (2001). After coding, sorting, arranging, comparing and contrasting the quotes, the categories were used for interpretations and discussion.

Findings

The results obtained from the open-ended questions and the interviews can be summarized under six main headings.

1. Reasons for accessing WebCT

Some students suggested that they are:

- (a) receiving updated information continually and easily;
- (b) obtaining help in doing the assignments and preparing for the examination;

- (c) communicating easily with tutors and peers;
 - (d) helped in completing the course;
 - (e) learning from each other in a convenient way; and
 - (f) keeping up their study schedules.
2. Reasons for not accessing WebCT
- Some students suggested that WebCT:
- (a) was not helpful to their studies, assignments and course completion;
 - (b) was of little interest or they were not concerned with it;
 - (c) provided duplicated information;
 - (d) was inconvenient to them and they had little time to access WebCT because of full-time jobs, family commitments and financial problems;
 - (e) didn't suit their individual learning style, was not user-friendly or they preferred reading hard copies.
3. Suggested items to be added to WebCT
- (a) past examination papers;
 - (b) softcopy of study units or study notes;
 - (c) multimedia tutorials (such as video conferencing tutorials and electronic tutorials);
 - (d) tutors' information (such as tutors' mailing address and telephone number)
 - (e) Web links for reference, and;
 - (f) computer-related items such as alert message, login record and search engines.
4. Suggested items to be deleted from WebCT
- (a) Chat Room, and
 - (b) E-mail, because they already have e-mail facilities.
5. Comments on WebCT included positive and negative comments.
- General positive feedback was given as follows.
- (a) WebCT is a good and convenient tool;
 - (b) students liked and enjoyed using WebCT for sharing and learning from each other;
- The negative comments were given as follows.
- (a) no solutions to the assignments were provided;
 - (b) no past examination papers were provided, with solutions;
 - (c) no course notes were supplied in WebCT;
 - (d) WebCT should have an interactive tool for real time communication;
 - (e) WebCT was very slow;
 - (f) preference expressed for asking questions in face-to-face tutorials, rather than online.

6. Suggestions for improving WebCT included:
- (a) redesign of the display of the messages in the Discussion Board;
 - (b) support for the use of Chinese characters in WebCT;
 - (c) adding software to allow typing of mathematical symbols;
 - (d) responding to students' messages quicker, and;
 - (e) providing additional lectures in CD-ROM format.

Discussion

Findings from the open-ended questions suggest some items that could be added, and some deleted from, WebCT. Students suggested adding the functions of electronic assignment submission (including late assignments) and grade tracking. Students also suggested adding items that could help them in preparing for the examination and for completing their studies. Some other suggestions included adding multimedia tutorials (such as electronic tutorials and video conferencing), Web links for references, an alert system to remind students whenever a news item was posted to WebCT, a login record and a software package for typing mathematical symbols. On the other hand, for those items the students found not helpful to them, they were suggested to be deleted from WebCT. Therefore, Chat Room and E-mail were suggested for deletion.

Feedback obtained from the interviews suggested reconsidering the design of the Discussion Board interface, providing software for expressing mathematics symbols or equations in the discussions, and adding support for Chinese characters. These suggestions could be implemented in future academic years for improving the effectiveness of the OLE, and attracting more students to participate in the Discussion Board and using the OLE.

Target-oriented Learners

The results suggest that the Discussion Board was a popular tool that students frequently accessed and which provided helpful information. Students in the present study in Hong Kong regularly accessed Discussion Board because they expected to get some help in doing their assignments. This is evidenced by their comments on why they always accessed this item and considered it helpful. Students commented that they accessed this item because they could discuss any problems in the assignments, and get some ideas about doing the assignments from the messages in the Discussion Board. This result is consistent with Fung and Carr's (1999) findings that the OUHK students expected to obtain academic support, rather than psychological and social support, during

the tutorials. They also expected to get some hints for helping them work on their assignments.

Engelbrecht and Harding (2001) obtained the analogous feedback from the students that they wanted more worked examples, more complete solutions to problems and plenty of past examination papers with solutions for their study of the results of a trial run for a Web-based Calculus course offered at the University of Pretoria in South Africa. This result is in line with the findings of Venter's (2002) study of the learning styles of Hong Kong, Malaysia and United Kingdom students. Typically, Hong Kong students were used to finding a source that contains the 'right' answer and they believed that gathering more information could lead to a better answer. They also considered their success in learning in terms of applicability to their work (Venter, 2002). This may be why the Discussion Board was accessed most frequently, since students could collect more information to prepare for their assignments and for their examination at the end of the course. The results suggest that many of the OUHK mathematics students were target-oriented learners. They considered the tool in WebCT as an effective tool, based on whether or not it helped them to do their assignments and complete the course.

Encouragement and Discouragement from Participation

The factors that encouraged students to participate in the OLE included getting updated information easily, solving their academic problems, reviewing or downloading supplementary course materials quickly, accessing the OLE at their own convenience, accessing the OLE without difficulty, communicating with peers and tutors, learning from others and checking study schedules. This is consistent with the results of Keller and Cernerud's (2002) study of students' perceptions of e-learning, as a supplement to traditional training at Jonkoping University in Sweden, in which students commented that they could get updated information easily using the Web platform, plan their own study time because of the increased flexibility and easily communicate with students who did not live close to the University.

White (2000) found that students liked the flexibility of online courses and the feeling of connection to peers and to the instructor, from the results of a Learning Online project at Grant MacEwan Community College in Edmonton, Canada. Similarly, a survey of the use of an online assessment tool for students in a linear algebra course (Siew, 2003) also revealed that students liked the flexibility in learning and its helpfulness in understanding the various topics of the course. These findings are consistent with the reasons for accessing WebCT in the present study.

According to students' perceptions, the factors that discouraged them from actively participating in the OLE included lack of incentive,

insufficient study help, slowness of the platform, technical problems, individual learning preference, lack of human contact, and problems inputting data. Tarbin and Trevitt (2001) reported that technical problems and individual learning styles were two of the obstacles that reduced students' participation based on their experience of offering e-mail discussion lists to their students. Some M121 students in the present study stated that they did not participate in the Online Learning Environment because of their individual learning styles.

Other researchers have found that technical problems, such as slowness of platform, was one of the disadvantages related to the use of Web (Keller & Cernerud, 2002; Perris et al., 2004) and having to wait a long time to load the information (Litchfield et al., 2002; White, 2000). The OUHK students commented that the Discussion Board interface should be re-designed because it needed a long time to compile thousands of messages each time they accessed it. Although these comments suggest that computer experience is related to the different types of technical problems, they indicate that technical problems are one of the obstacles that discourage OUHK mathematics students from participating in the OLE. It is suggested that administrators should manage the Discussion Board more effectively and provide more WebCT training for beginners.

A few M121 students in the present study commented that they did not use the OLE because the system could not support Chinese characters and they could not express their problems well using English. Robertshaw (2001) found that it was very easy to misinterpret e-mail messages when messages were written in a hurry, based on his experience of coordinating a foundation Internet course at the OUHK. This is particularly the case for Chinese students who use English as a second language. For these students, it is not always easy to express what they want to say accurately using English, even when the messages are written carefully and slowly. The use of a second language for communication is thus a problem that discourages a few students from participating in the OLE.

The feedback obtained from the students at the OUHK on using mathematical symbols with computers was similar to that made by students at Curtin University of Technology in Perth, Western Australia (Siew, 2003). Curtin University of Technology students commented that they were required to express mathematical symbols with many operations such as square root, complex entries and "to the power of" and that they often needed to attach a file to express mathematical equations in the Discussion Board or E-mail. Therefore, as the OUHK students' suggested, it would be better if the OLE system supported both Chinese and English languages, and the use of mathematical symbols.

The Chat Room was the tool that the OUHK mathematics students used infrequently. The reasons for the low usage of the Chat Room

included no time to schedule the chat beforehand and preferring to use their own e-mail. This result is similar to the reasons given by the students in Sanders and Morrison-Shetlar's (2001) study, such as conflicts with time because of job and family commitments, and the Chat Room being a synchronous mode of communication requiring students to be available at a specific time of the day. Therefore, the majority of M121 students did not use Chat Room at all because of time pressures and because they preferred to use modes of asynchronous communication, such as E-mail or the Discussion Board.

Some of the OUHK students commented that they preferred to communicate with I Seek You (ICQ) rather than with Chat Room because they could talk freely with anonymity. This comment is consistent with Kennedy's (2002) finding that a Hong Kong Chinese student who was perhaps unwilling to speak out in class, might participate in collaborative group learning via e-mail. Therefore, the format of synchronous mode of communication may need to be changed, if we want to keep providing this kind of communication for the OUHK students. For instance, the provision of electronic tutorials (e-tutorials) may be a worthwhile suggestion for increasing synchronous communication.

Mixed Learning Modes

Although students generally commented positively on the use of the OLE, there were a few students who still preferred to have face-to-face communication. Without real contact between students and teachers it is easier to misunderstand (Keller & Cernerud, 2002), especially when almost all of the students and tutors used English as their second language in the M121 course. Keller and Cernerud (2002) found that lack of human contact was one of the disadvantages related to the use of a Web platform in their study. Leung's (2003) study of evaluating the effectiveness of e-learning at the Hong Kong Polytechnic University reported that cyber learners suggested providing more face-to-face classroom tutorials for improving their learning experience. In addition, the results of a study of students' learning outcomes and patterns of interaction, within an online discussion forum, revealed that, although the majority of students found the online discussion forum a worthwhile facility, 51% of them preferred to have face-to-face discussions (Thomas, 2002). Consistent with these research findings, some of the M121 students in the present study indicated that they preferred to ask questions in face-to-face tutorials rather than use the Discussion Board.

Hong Kong is a small city geographically and has a good transportation system. Traveling to tutorial centers is easier and faster than in some cities in other countries such as London in the United Kingdom and Los Angeles in the United States. Geographic factors may,

therefore, be less of a problem for Hong Kong students than in the United Kingdom or in the United States. Therefore, it's questionable whether e-learning is necessary for students attending school in Hong Kong. On the other hand, the electronic tutorial has been promoted very rapidly during the past two years at the OUHK. Based on the findings of this study, it seems that it is still too early to provide e-tutorials to replace face-to-face tutorials completely for non-computing courses. As Kennedy (2002) mentioned in his conclusion drawn from the discussion about adult learners and online learning in Hong Kong, some Hong Kong adult learners prefer a 'mixed mode' of learning support. It may be that a compromise is the most appropriate solution, with a mixed teaching mode being suggested for future academic years. Students, therefore, could obtain the experiences and benefit from both e-tutorials and face-to-face tutorials.

Flexibility

Some literature has shown that using computers provides flexibility and convenience to students (Hofmann, 2002; Leung, 2003; Siew, 2003). One of the results of the present study is that convenience was one of the factors that encouraged participation in using the OLE. Alternatively, some findings from other literature contradicts the result of flexibility, and found that some students valued printed materials because they were readily transferable, portable and require little training on usage (Perris et al., 2004). As a result, the use of computers reduced flexibility for distance learners in terms of where and when they study (Kear et al., 2004). This is similar to the comment given by some M121 students in the present study, that it was not convenient to read the documents on the computer screen and they preferred to read the printed study units because they could read them when they were on the way to their offices or homes. It is surprising to see that some students said the use of the OLE provides flexibility but some others think it reduces flexibility. As flexibility of learning is an important element for adult learners, the benefits and disadvantages of using computers, therefore, needs to be carefully considered for distance learners.

Importance of Communication

The use of computers has become widespread in education at all levels over the last three decades (Khine, 2001). The findings of the present study demonstrate that communication through computers is important to OUHK students. Although many students only browsed the information in the OLE, some students commented that their knowledge was enhanced and they were able to confirm what they had learned from other messages, and understood the course content much better. This

reveals the importance of Discussion Board because students can grasp the helpful information and solve their own problems with this new information.

The present study showed that M121 students in Hong Kong enjoyed discussions with their peers. They also indicated that the Discussion Board was a good channel to express their ideas and ask questions, so the OLE is very helpful for studying and communicating with tutors and other students. Similar results were obtained from Buckingham's (2003) study of nursing students' perspectives on the experience of a learning community through online discussion at Malaspina University-College. One of the findings showed that nursing students liked to stay connected with their peers. All the nursing students who participated in the survey felt that online discussions enhanced their knowledge and improved their intellectual skills and critical thinking skills. They suggested that students' knowledge could be constructed and accumulated based on communication with others (Buckingham, 2003). In addition, computers appear to be an important tool for communication since students generally accepted the use of computers in their studies and enjoyed the flexibility they provided. Therefore, communication through computers and constructivism are very important to understanding how distance learners learn and participate at university.

Concluding Comments

The results of this research show that the use of the OLE is perceived by students to enhance their mathematics learning and it is perceived to be a helpful tool for communication and obtaining information. That the OLE does not allow the use of Chinese and mathematical symbols may partly detract from its usefulness for mathematics students. Therefore, it is suggested to the administrators at the OUHK that they insert the use of Chinese characters and mathematical software for typing symbols and equations easily into the use of the OLE.

Any strategies that could help students to complete their assignments, or complete the course, and encourage participation in the OLE should be implemented by teaching staff and administrators. For example, on the administrative side, some video-CDs could be produced for new students to teach them how to manage their time when they are going to be distance learners and how to prepare themselves to use computers to help with their studying and communication. The hotline technical support could prolong the service hours until midnight so that students could get help late at night. After solving the administrative and resource problems at OUHK, electronic submission of assignments and electronic assignment records could be added to the OLE so that students could

submit their assignments and check their results conveniently. Also, an alert system could be added to remind students about some important dates such as the tutorial dates and the cut-off dates for the assignments so that students would be readily aware of them.

The teaching staff could provide study advice at the beginning of the course so that students would be aware of the difficulties they might face, and provide the key points of study units to assist students to grasp the main theme of the course more easily. Additional examples and exercises could be added to each study unit for practice. Some questions related to the assignments could be provided in a discussion forum to enhance students' understanding of the course content. As a whole, the university should consider the provision of computing support on the basis of students' needs.

The provision of the OLE is being strongly recommended to academic staff at the OUHK, and academic staff at other universities in Hong Kong and mainland China. To date, there has been limited research on distance learning students' perceptions of using computers in their learning, especially in the case of Hong Kong distance students. Therefore, the results of this study should provide useful information not only for academic staff at the OUHK, but also for the educators and researchers who are interested in distance education, mathematics education and distance learning students' perceptions of using computers. Since OUHK students are adults and have a wide variety of educational backgrounds and reasons for studying, they usually have different attitudes to learning. These different attitudes to learning may result in different approaches to learning. The issues including students' learning attitudes and learning styles should be considered for further investigation.

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