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Computer Aided Learning in the Community Follow-up Module: A Pilot Study

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ABSTRACT

Introduction: The need to deliver teaching material to undergraduates using the Internet is compelling in view of the many advantages that the Internet provides. Reports on the use of Computer Aided Learning (CAL) in teaching various major disciplines in medicine show that CAL increases the knowledge of students and is accepted as a teaching method among medical students. In view of this, the Faculty of Medicine and Health Sciences (FMHS), Universiti Putra Malaysia, embarked on a pilot study on the use of CAL for the teaching of Year Four medical students undertaking the Community Follow-up Project (CFUP) to test the viability of CAL as a teaching method. **Objectives:** This paper describes our experience in the design and deployment of CAL as a complement to the traditional teaching methods of CFUP. We also present the findings of a survey on students' opinion of the use of CAL in the CFUP. **Methods:** A website containing lecture notes, and a discussion forum was set up to provide the CAL component. Students were asked to access the website, download lecture notes and participate in a tutorial in the form of the discussion forum. A survey was conducted at the end of the CFUP to gauge students' experience of computer use and their reaction to the CAL. **Results:** CAL was successfully implemented in the CFUP. The post course survey indicated that students were able to use the CFUP website, and gained from the teaching material posted online. **Discussion:** A high percentage of our students possessed their own computers and all participants had access to the Internet. Students were able to access the website and participate in the discussion forum. **Conclusion:** The results demonstrate that it is viable to use CAL as a teaching method in the CFUP.

Keywords: Computer-aided-learning (CAL), Internet, medical-students, Community-follow-up Project (CFUP)

INTRODUCTION

The advent of computers and the Internet has given rise to the possibility of using distributed teaching to reach a wide audience of learners. The Internet has enabled organizations, in particular institutions of higher education, to conduct various courses entirely electronically and without regard to physical geographical boundaries[1].

Information and Communication Technology (ICT) has been used with success in the delivery of instruction in diverse fields such as business, languages and computer science. A leading United Kingdom (UK) university has listed more than several dozen sites where higher education is being delivered by universities to students entirely through the Internet[2]. In medicine, Ireland has taken a lead in using ICT and equipping medical graduates with knowledge in information technology and its relevance to medicine[3].

There are several reports of the use and evaluation of Computer-Aided-Learning (CAL) in teaching various major disciplines in medicine including urology and surgery,[4,5] oncology,[6] and pathology[7]. The use of CAL has engendered much enthusiasm among medical teachers to the point that a consortium of leading medical schools is exploring the feasibility of forming an international virtual medical school[8].

Malaysia's National IT Council has articulated the National IT Agenda (NITA) with the aim of using ICT to transform Malaysia into a developed nation. The NITA includes E-Learning as one of five Strategic Thrust Areas to "assist the migration of Malaysians into the E-World"[9].

Following the aspirations of the NITA, universities in Malaysia have started to implement ICT-based teaching. The University Malaysia Sarawak (UMS) experimented with a web-based method for teaching a statistics course. Although only reporting preliminary data, the authors are of the opinion that students found the course beneficial with the added advantage of turning students from being passive to active learners[10].

The need to deliver teaching materials to undergraduates using the Internet is compelling in view of the many advantages that the Internet provides, such as opportunities for asynchronous learning, 24-hour availability of material, disregard for geographical location, immediate updating of changes, and savings in terms of travelling time and expenses both for students and the university. In view of this, the Department of Community Health, Faculty of Medicine and Health Sciences (FMHS), Universiti Putra Malaysia, embarked on the use of CAL as a pilot project for the teaching of Year Four medical students undertaking the CFUP. This paper describes our experience in the design and deployment of CAL as a complement to conventional teaching for the CFUP. The results of a post-course survey to assess students' opinions of the CAL are also discussed.

METHODS

A cross-sectional survey was conducted at the end of the first CFUP posting in November 2003. This post-course survey was conducted among all Year Four medical students (2003/2004 session) who completed the CFUP posting from July 2003 to November 2003. The aim of the survey was to assess students' opinions of the CAL.

The CFUP

The aim of the CFUP is to teach students the various factors that can impact on the health of a patient. In order to get a deeper understanding of how an illness can affect the lives of patients, students choose a patient admitted to either the Paediatrics or Obstetrics and Gynaecology (O&G) wards and follow-up their patients once they have been discharged from the ward. This "after-the-hospital-episode" aspect of care exposes the student to the patient's own milieu and the student sees what happens to the patient when the patient returns home and to his community. The student learns how the patient, and/or carer, copes with the patient's illness outside the relatively supervised care environment of the hospital.

Throughout the time period of CFUP, students' understanding of the disease process and management of the patient whilst in the ward is overseen by clinical supervisors.

Community supervisors oversee the students' understanding of the importance of continuing care and support systems in the general community to the patient's health and rehabilitation.

Students' achievements of the objectives of the CFUP are assessed through two means at the end of the module, via the project presentation and the written report. Students are required to demonstrate, in their presentations and reports, their understanding of the various factors that may impact on a patient's health and rehabilitation from an illness or illnesses.

The CAL Component

The CAL component consists of a website hosted on the faculty's server. This website, known as CFUOnline, contains several lecture notes and presentations that are downloadable for students to read in their own time. None of these lectures or presentations are delivered in the classroom. These online notes serve to provide students with material which, combined with the classroom seminars, provide enough background knowledge for them to carry out their CFU projects.

The major element of the website is a discussion forum. An online tutorial, which in essence replaces a face-to-face tutorial given in a classroom, and consists of a case study, was uploaded to the site. The aim of the tutorial was to get students to think about the case and the various factors that impact on a patient's illness. The form of the online tutorial followed the requirements of the written reports which students had to submit at the end of the module. Students were required to access the tutorial and post their responses to several questions on the discussion forum. All student were required to do so and their participation was monitored.

The CAL Component: Terminology

The use of the Internet for teaching and learning has spawned several terms viz computer aided instruction (CAI), web-based learning (WBL), managed learning environment (MLE) and virtual learning environment (VLE). We use the term CAL to denote the employment of the Internet for the delivery of teaching material, conduct of discussion, assessment of performance and interaction between students and teachers. It does not include the use of stand-alone technologies such as CD-rom, DVD, audio or video-cassettes.

The CAL Component: System Design

The system employed consists of a Web interface using the MySQL database management system as a backend and the PHP program as middleware, hosted on the faculty's web server. Both programs are well-known, open-source software and used together to implement websites that allow for storage of user data and input. There are several cases of implementation of both programs and both are used by several universities for online teaching[11]. All teaching materials are posted on the web. Access to the website is through a web browser and requires authentication. Users need to acquire usernames and passwords for this purpose. All users had access to their own homepage, e-mail, online discussion boards and the ability to up-and download files. The whole system was intensively tested prior to deployment.

Use of Web Interface

A briefing on the use of the Web interface was given to both teachers (supervisors) and students. Students were explicitly shown the interface and taken through its use step by step.

Website Files and Services

The website offers several files and services accessible only to registered users. The website contains all the material used in the CFUP along with an online tutorial and several lecture notes, course time-table, list of supervisors and the log book.

Upon logging in, users are able to:

1. access their own homepages which are allocated automatically by the system.
2. use the Discussion Forum which handles the main activity on the site. This forum consisted of a prototype case study. Students are required to read and understand the case and then post their answers on the website itself. The answers are in the form of a discussion thread and are visible to all visitors in the forum.
3. access lecture notes and extra tutorials in the form of electronic files which are available for download or are readable online.

RESULTS

Student Survey

In order to assess students' reactions to the use of CAL, we conducted a survey using a structured questionnaire at the end of the module. The questionnaire was administered to all students (N= 41) who had completed the CFUP from July 2004 to November 2004. The response rate was 100%. The results of the survey are shown in Table 1.

General Computer Use

Most students (92.9%) own computers. All students had used computers by the time they started Year Four of the medical course. 73.8% had used computers for more than a year. Some had computer experience prior to joining the faculty. The majority (90.4%) of students used computers in both the university and at home. Less than 5% used computers either at home or the university exclusively. All students had access to the Internet. The great majority of students accessed the Internet at least once a week: 38% used the Internet only weekly followed by 33% who used it more than once weekly. About 20% accessed the Internet daily or more than once a day. The majority did not use online resources such as forums (73.8%) and newsgroups (69.0%).

Students' Opinion of the Website

The students found the website easy to navigate (31.0%) but almost half of them (48.8%) were neutral as to the ease of getting information or help from the site. Forty-two point nine percent (42.9%) of students agreed that the website made it convenient for them to learn the CFUP, and 35.8% agreed that the website was a good replacement for face-to-face teaching.

Table 1: Results of the survey on year four medical students on computer use and their opinions on CAL in CFUP (July 2004 – November 2004)

Questions	Number	Percentage(%)
General computer use:		
1. Do you own a computer		
- Yes	39	92.9
- No	39	7.1
2. How long have you used a computer		
- 1 year or less	1	2.4
- More than 1 year	31	73.8
- Cannot remember	10	23.8
3. Where do you use the computer		
- At the university only	2	4.8
- At home only	2	4.8
- Both at home and university	38	90.4
4. How often do you go on the Internet		
- Once a week	16	38.1
- More than once a week	14	33.3
- Once a day	6	14.3
- More than once a day	2	4.8
- Less than once a week	4	9.5
5. Do you use e-mail		
- Yes	42	100.0
- No	0	0.0
6. Do you subscribe to newsgroups		
- Yes	13	31.0
- No	29	69.0
7. Do you participate in online forums		
- Yes	11	26.2
- No	31	73.8
Opinions on website and CAL		
8. It is easy to navigate the site		
- Agree	13	31.0
- Neutral	12	28.6
- Disagree	10	23.8
- Strongly disagree	7	16.6
9. It is easy to find information on the site		
- Agree	14	33.4
- Neutral	20	47.6
- Disagree	5	11.9
- Strongly disagree	3	7.1
10. It is easy to get help on the site		
- Agree	13	29.2
- Neutral	20	48.8
- Disagree	7	17.1
- Strongly disagree	2	4.9

Table 1 *cont.*

Questions	Number	Percentage(%)
11. The site eased your learning in general		
- Agree	15	35.8
- Neutral	19	45.2
- Disagree	5	11.9
- Strongly disagree	3	7.1
12. The site makes it convenient to learn the CFU subject matter		
- Agree	18	42.9
- Neutral	16	38.1
- Disagree	6	14.3
- Strongly disagree	2	4.7
13. The site is a good replacement for face-to-face teaching		
- Agree	15	35.8
- Neutral	12	28.6
- Disagree	11	26.2
- Strongly disagree	4	9.4

DISCUSSION

Implementation of CAL involves considerable use of resources in terms of computing hardware: time expanded in designing and testing the Web interface; production of electronic documents; preparation of supervisors as well as instruction of students on the use of the Web interface. There were several basic issues that needed clarification. We were not sure of students' ownership of computers, access to the Internet, their competence with computers and their confidence in using the technology.

In the UK, studies show that professionals who are not computer-literate will be disadvantaged, less professionally competent and even isolated[12]. In the United States, medical students are given strong grounding in the use of computer technology to manage information, support patient care decisions, select treatments and develop their abilities as life-long learners[13].

Our pilot study has demonstrated the viability of implementing a CAL program for undergraduate medical students. We were able to set up a website to support the teaching of the CFUP. Students were able to use the online tutorial to get an understanding of the module requirements and to use it to inform their own work. This online tutorial was a crucial component of the teaching in the CFUP as it contained guidance on how to approach a case and how to consider the various factors that affect a patient's health. The face-to-face tutorials of course expanded on the contents of the online tutorial and over several physical tutorial sessions students were checked as to the completeness of their study, but the fact that this "enabling" tutorial was given online and not in the classroom points to the ability of CAL to help our students achieve their learning objectives.

Our students agreed that the website complemented face-to-face teaching, as well as made it convenient for them to learn CFUP. This finding is similar to a review of the use of

CAL in dentistry by Schittek *et al.* [14] who found that CAL saves time for the teacher and student in the long term, thereby making studying much more convenient for the student.

Although our students found the website easy to navigate, they were neutral as to whether it was easy for them to find information or help. This could be due to the novelty of the mode of learning; students were learning a component of the CFUP entirely from the Internet and they may not be familiar with the use of the Internet or the website. Only 20% of our students reported that they accessed the Internet daily or more than once a day. This may have an impact on their familiarity with the use of the Internet and thus their use of the website. In his review, Schittek also found that students have to be familiarized with the Internet in order to facilitate their studying using the CAL[14].

Another study by Steele *et al.*[15] on learning preferences, computer attitudes and student evaluation of computerized instruction, suggested that care needs to be taken to make navigation of the website simple for the students. Features like test colour changes, free response questions, having access to key information, the development of printed summaries as well as giving the students the option of creating their own printed summary should be considered[15].These aspects should be taken into account as we work on further developing our CAL program.

Our CAL project was modest in terms of content as our main objective was to conduct a pilot viability study and run the CAL website as proof of concept. The website contained only one exercise, a case study, and several electronic documents. Nonetheless we were delighted to find that all our students were able to access the website and use it.

It is reasonable to expect that with further development, CAL can be used to teach our undergraduates computer skills, the usefulness of medical informatics and the employment of ICT for various other tasks. This is more so in view of the fact that the majority of our students do not make use of online resources such as forums (73.8%) or newsgroups (69.0%).

CONCLUSION

Our pilot study has found that using the Internet to deliver teaching is viable. As a teaching method, CAL can supplement conventional classroom teaching in the CFUP. CAL can be used to deliver crucial teaching material and assist students in meeting their learning objectives. Apart from the delivery of teaching materials, the use of CAL may not only stimulate students to use the resources found in the Internet to help them in their studies, but also build up their skills so that they develop into Internet literate medical graduates.

Further development of CAL in the FMHS will require a formal review and the input of teachers, students and other staff. Nonetheless, there is potential for more CAL programs to be developed for other modules in the medical curriculum of the FMHS in order to produce doctors who are computer literate and comfortable in the use of ICT in their profession.

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