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International Journal of Health Research, June 2008; 1(2): 63-72

Available at http://www.ijhr.org

Open Access
Online Journal

Original Research Article

Pharmacy Students Perception of the Application of Learning Management System in Patient-oriented Pharmacy Education: University of Benin Experience

Received: 10-May-08 Revision received: 02-Jun-08 Accepted for publication: 04-Jun-08

Abstract

Objective: *To evaluate pharmacy students' perception of the application of learning management system (LMS) in their education in a Doctor of Pharmacy program in Benin City.*
Method: *In a special ICT class, 165 pharmacy students were introduced to LMS using an open source program, Docebo© after which a questionnaire with core questions in five domains, namely, sociodemographic data, access to computer and internet, problems in applying ICT facilities, perception of e-learning and LMS was administered. Students' responses to the questionnaire were analysed.*
Results: *Although most students (84%) had access to internet, only 16.1% owned computers and majority (82.1%) use cybercafés for internet access. Frequent electric power failure, inadequate computer facilities, skilled personnel, and slow internet speed were identified by 64.8–82.5% of the students as problems in using computer facilities in the University. While willingness to pay was not considered a problem, 80.4% of the students were only willing to pay not more than US$ 7.96 per semester for internet access. Over 92% of them felt that LMS will make teaching and learning more exciting and effective when combined with the traditional teaching approach.*
Conclusion: *The use of LMS will improve the teaching and learning of pharmacy students.*

Keywords: *LMS, e-Learning, pharmacy students, ICT, teaching and learning*

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Introduction

The radical changes in health care delivery and patient-oriented care (pharmaceutical care) are now leading to the implementation of changes in pharmacy education in many countries. This is reflected in curricular changes in Universities in many countries, and information and telecommunication technologies (ICTs) are now being applied in teaching and learning to make pharmaceutical services more effective[1-3]. In this respect, the usefulness of computer-aided-learning (CAL) in enhancing understanding has been reported in earlier studies[4,5]. It is now known that access to wide range of online resources through the use of ICTs in pharmacy makes learning more exciting, effective and likely retained[6]. Although globalization has long been expected to encourage universities in developing countries to invest reasonably in the use of media and technology within the open and flexible learning systems[7], many universities in Nigeria have not yet fully exploited the potential of e-Learning or experimented on how it will be effectively employed in improving teaching and learning probably because of lack of technical and pedagogical readiness to support e-Learning[8]. In the existing traditional system of teaching, which exists in nearly all higher institutions in Nigeria to date, students often rely on lecture notes made out from classroom lectures and lecture handouts from lecturers. Access to current books and other relevant information that can enhance learning are limited for the learners due to fund related issues. Most students have limited access to the internet, and the current level of interaction between students and lecturers is very low because of time, and high student to lecturer ratio.

Today, the practice of pharmacy in Nigeria is undergoing major technological advance-ment that requires that the training of today's pharmacy students must incorporate the use of technologies[12]. One approach is the use of the learning management system (LMS) to manage teaching and learning. LMS is "used to describe software tools that are designed to manage user learning interventions"[13]. It has the capability of increasing access to educational materials often needed by the students for effective learning while still providing the extensive range of complementary functionality that it offers[14]. It can provide online access to course materials, assignments, discussions, assessment and grade books, communication and collaboration, registration, records, transcripts, schedules, reports, etc[15]. LMS may be web-based and tracks users and their progress and performance across all types of training activities[13].

The main objective of this work is to determine the pharmacy students' perception of the application of LMS in their training. Specific objectives are to (1) determine the students' access to computers and internet on campus and at home, (2) assess the problems students are likely to have in applying LMS, and (3) evaluate the students 'willingness to make use of LMS in learning. It is expected that the findings in this work will be useful in applying LMS to other programmes in the University of Benin and elsewhere in the country.

Method

Study design

The study was carried out in Faculty of Pharmacy, University of Benin, Benin City with a student population of 768, a yearly intake of a maximum of 130 students, and student to lecturer ratio of 11.3. A minimum of 6 years academic years (1 year of basic sciences/general studies and 5 years of professional pharmacy education) is required to be awarded a degree of Doctor of Pharmacy (PharmD) degree which replaced the Bachelor of Pharmacy degree in 2002.

After reviewing the literature[4,5,10,14,16-19], a 2-page structured questionnaire with closed and open-ended questions was designed, tested and re-tested with 30 students and the

internal-consistency reliability coefficients (Cronbach's alpha) was at least 0.75. Core items in the questionnaire were in 5 domains namely, socio-demographic data, access to computer and Internet, problems in applying computer facilities in the school, and perception of e-Learning and the learning management system (LMS). It was self-administered to 165 students in their third and fourth years (representing 90.2% of the total number of students in the 2 classes and 21.5% of the total number of students enrolled in the Faculty). Included in the study sample were all students who attended a pre-arranged introductory class on LMS, consented to participate, spent at least one full year of professional academic activities in the Faculty, received basic ICT training (usually in the first semester of the third year), and would still be studying in the Faculty for additional 2 or more academic years. Excluded were students who did not attend the LMS class or accept to participate.

Following appropriate institutional approval, an open source LMS software, Docebo© version 3.07 (Docebo SRL, Italy) was downloaded and configured on a Windows 2000 server. The software was selected because it focuses on e-Learning, allowing lecturers to upload their lecture notes, problem sets, exams, self-evaluation, and even videos of lectures to a local server accessible through the local area network and on Internet for all registered students to use. It also allows students communicate with each other and with their lecturers using the chat and e-mail components (detail of the functionality is available at http://www.docebo.com). Other than the various functions outlined above, the software was selected because it is free, and easy to install and use. Samples of course materials, including downloaded web pages, lecture materials prepared with Microsoft Word and Adobe portable document format (pdf), self-evaluation and continuous assessment tests, and sample e-mail communication between students and a lecturer in respect of the course materials were prepared. A special ICT class was arranged for each of the 2 levels of students during which the concept of LMS and advantages of the software were discussed with the students. This was followed by a demonstration of the functionality of the software which included server login procedure for students, access to course materials, live chat with fellow students and lecturers, answering self-evaluation questions and assessment test, viewing the results of the answers provided and project handling with supervisors. After responding to questions raised by the students, the questionnaire was administered. It took an average of 15 min to complete each questionnaire.

Reliability and validity of survey instrument

The data reliability, internal-consistency reliability coefficients for all completed questionnaire (during both pre-test and actual survey) were determined using Cronbach's alpha. The test and retest internal-consistency reliability coefficients for the data being reported ranged from 0.86 to 0.92.

Data Analysis

The data collected from the respondents were coded and entered into the computer using Epi-info 2003 (CDC, USA/WHO, Geneva). Responses to open-ended questions were categorized as appropriate before entering into the computer software. Data entered into the computer were double checked to ensure accuracy. Questionnaire with incomplete and/or inconsistent answers were eliminated. For example, a respondent's claim of owing a computer but not having access to computers was considered inconsistent.

Statistical calculations were performed with Instat™ (Systat Software Inc., USA). Descriptive (frequency and percentages) and correlation statistics were employed in presentation of data. Proportional data were compared using chi-square test or Fisher's exact test (Instat™, GraphPad Inc., USA) as

appropriate. At 95% confidence interval, 2-tailed p values less than 0.05 were considered to be significant.

Results

Ninety percent (90.2%) of the 183 students registered in the third and fourth years completed the questionnaire. The response rate was 98.8% but one of the respondents had inconsistent responses to the questionnaire and the questionnaire was therefore excluded from the data analysed bringing the number of questionnaire analysed to 162.

Socio-demographics data

The socio-demographic variables are presented in Table 1. Half of the respondents were males while the others were females. Only 5.6% of them were below 20 years of age and majority (72.5%) were within the age bracket of 20 and 24 years. Over 95% of them were Christians and less than 10% of either their fathers or mothers were unemployed. There was a significant different between the proportion of respondents in year 3 and year 4 in relation to the ages of the students (p=0.022).

Table 1: Sociodemographic variables of respondents

Variables	Year 3 students	Year 4 students
Age (yrs)		
15-19	8 (5.0)	1 (0.6)
20-24	50 (30.9)	67 (41.4)
>25	19 (11.7)	17 (10.5)
Total	77 (47.5)	85 (52.5)
	χ^2=7.649; df=2; p=0.22	
Sex		
Male	40 (24.7)	41 (25.3)
Female	37 (22.8)	44 (27.2)
Religion		
Christianity	74 (45.7)	80 (49.4)
Islam	3 (1.9)	4 (2.5)
Others	0	1 (0.6)
Father's occupation		
Self employed	35 (21.6)	39 (24.1)
Government employee	33 (20.4)	29 (19.9)
Private company employee	4 (2.5)	6 (3.7)
Unemployed	3 (3.1)	13 (6.8)
Mother's occupation		
Self employed	35 (21.6)	44 (27.2)
Government employee	30 (18.5)	31 (19.1)
Private company employee	4 (2.5)	4 (2.5)
Unemployed	8 (4.9)	6 (3.7)

Access to computer and Internet

The students' report on their access to computer and internet are summarized in Table 2. Although as many as 84% of the students had access to the internet, only 16.1% had their own computers. Some of them (51.2%) used computers outside the cybercafés in and around the university campus. Majority (82.1%) used the cybercafés to access internet information. Only a small proportion of the respondents (<12.5%) had free access to the internet, used internet at home or in the Faculty e-Learning Centre. Mobile phones were rarely used to access to access the internet by the respondents. While only 7.4% of them preferred to use internet during school hours, majority (92.5%) preferred accessing internet after school hours. Although majority of them (86.7%) were willing to pay for internet access, less than 1% were willing to spend as much as ₦5,000.00 (US$ 39.81) per semester (two semesters in each academic session). In fact, 80.4% of the students that were willing to pay only indicated they will pay as low as ₦1,000.00 (US$ 7.96) per semester. There was no significant difference between the responses of the students in the two levels (p>0.05). Access to the internet and ownership of computers were not predicted by socio-demographic characteristics.

Table 2: Access to computer and Internet. Percentages in parentheses

Variable	Year 3 students	Year 4 students
Has a computer*	17 (10.5)	9 (5.6)
Have access to a computer outside cybercafés*	40 (24.7)	43 (26.5)
Have access to Internet*	69 (42.6)	67 (41.4)
Have free access to Internet	8 (4.9)	12 (7.4)
Access Internet at home	2 (1.2)	4 (2.5)
Access Internet in Faculty e-Learning centre	8 (4.9)	12 (7.4)
Access Internet in cybercafés	67 (41.4)	66 (40.7)
Access Internet through mobile phone	0 (0)	3 (1.9)
Prefer to use Internet during school hours*	5 (3.1)	7 (4.3)
Prefer to use Internet after school hours*	72 (44.4)	78 (48.1)
Willing to pay for Internet access*	58 (35.2)	85 (51.5)
Will pay ₦1,000.00 (US$ 7.96) per semester	49 (29.7)	66 (40.0)
Will pay ₦2,000.00 (US$ 15.92) per semester	6 (3.6)	14 (8.5)
Will pay ₦3,000.00 (US$ 23.88) per semester	3 (1.8)	4 (2.4)
Will pay ₦5,000.00 (US$ 39.81) per semester	0	1 (0.6)

$^{*}\chi^2 = 3.170$, df = 4, p = 0.530; US$ = US dollar; US$ 1.00 = ₦125.60

Table 3: Problems in applying computer facilities. Percentages in parentheses

Variable	Year 3 students	Year 4 students
Considers electric power failure a major problem	59 (35.8)	77 (46.7)
Computer facilities are not adequate	61 (37.0)	71 (43.0)
Considers personnel a problem	41 (24.8)	66 (40.0)
Not willing to pay for access to Internet	19 (11.5)	22 (13.3)
Internet speed is too slow	55 (33.3)	72 (43.6)

$\chi^2 = 1.693$, df = 4, p = 0.792

Problems in applying computer facilities

Majority of the respondents (64.8 – 82.5%) identified frequent electric power failure, inadequate computer facilities, skilled personnel, and slow Internet speed as problems militating against the use of computer facilities in the University. Willingness to make financial contribution towards the provision of computer facilities was only seen as a problem by 24.8% of the students (Table 3). There was no significant difference between the responses from the respondents in year 3 when compared with those in year 4 ($p > 0.05$)

Perception of e-Learning in pharmacy education

Most students (89.7%) were very interested in the use of e-learning. Over 94% of them liked the idea of incorporating e-learning into the teaching and learning environment and believed that the application of e-learning will make teaching and learning more exciting and effective (Table 4). There was no significant difference between the information provided by the two different classes ($p > 0.05$).

Prior to the introduction of the learning management system (LMS) to the students, only 24.8% of them knew what LMS meant. Following a proper understanding of the concept of LMS (as determined by responses to a series of questions about LMS posed to the students during the introduction class), majority of them indicated interest in its application in their education. Over 92% of them felt that LMS will be useful when combined with the lecture notes provided in class during lectures. While as

many as 57.6% did not like the idea of replacing the lecture notes provided in class during lectures with LMS, 82.5% preferred a combination of LMS and lecture notes for visual intensive and difficult to conceptualize courses. Majority of the respondents (52.1%) wanted LMS applied only to some of (rather than all) their courses while only 6.6% did not want LMS applied in their teaching (Table 5). Although there was a significant difference between the responses from the students in the different classes (p = 0.025), there was no significant difference between those who wanted LMS applied to all courses when compared with those that wanted it applied only to some courses (p = 0.206).

Discussion

The introduction of Doctor of Pharmacy (PharmD) degree programme into Nigeria's Universities offering pharmacy degrees meant in 2002 that such Nigerian Universities were expected to produce pharmacy graduates with improved patient-oriented knowledge and skills. If such pharmacists are to provide optimal patient

Table 4: Perception of e-Learning in pharmacy education. Percentages in parentheses

Variable	Year 3 students	Year 4 students
Interest in e-learning		
Not interested	2 (1.2)	1 (0.6)
Have some interest	2 (1.2)	8 (4.8)
Very interested	72 (43.6)	76 (46.1)
Like the idea of incorporating e-learning into learning environment	74 (44.8)	84 (50.9)
Believes that the application of e-learning will make it more exciting and effective and likely to be sustained	76 (46.1)	83 (50.3)

χ^2 = 3.579, df = 4, p = 0.466

Table 5: Students' perception of Learning management system (LMS). Percentages in parentheses

Variable	Year 3 students	Year 4 students
First time of hearing about LMS	58 (35.2)	66 (40.0)
Likes the concept of using LMS	75 (45.5)	78 (47.3)
Thinks LMS will be useful with lecture notes provided in class during lectures	74 (44.8)	79 (47.9)
Would prefer LMS applied in place of lecture notes provided in class during lectures	30 (18.2)	40 (24.2)
Prefers LMS for visual intensive and difficult to conceptualize studies	30 (18.2)	76 (46.1)
Would prefer a combination of LMS and lecture notes (provided in class during lectures) for visual intensive and difficult to conceptualize courses	61 (37.0)	75 (45.5)
Would like LMS applied to all the courses	39 (23.6)	34 (20.6)
Would like LMS applied to some of the courses	37 (22.4)	49 (29.7)
Do not want LMS used in teaching	3 (1.8)	8 (4.8)

χ^2 = 17.532, df = 8, p = 0.025

care, they must be able to use resources that can effectively optimize care of the patients[20]. It was necessary to carry out this survey because previous experiences have shown that stakeholders' involvement in curriculum development is essential in bringing about a successful improvement in educational programmes[21].

Over the last 6 years, there has always been a relatively gender balance in the students enrolled into the Faculty studied with the males occasionally exceeding the females by not more than 6%. This can explain the gender balance of the study sample. Expectedly, majority of the respondents were above 19 year of age as over 85% of students enrolled in the entire University are often more than 17 years at the time of enrollment. The predominant Christian religion in the southern part of the country explains why nearly all the respondents were Christians.

Access to computer and internet

In a previous studies, it was demonstrated that computer education was beneficial to our students in improving learning, professional competence, team work, problem-solving ability and self-confidence, as well as acquiring new knowledge and opening opportunity for life-long learning[12]. In the present study, direct measures of ICT-literacy were not therefore measured. All the respondents had received a 75 hr (one semester) course on computer literacy prior to the study and none of them was a novice in the use of computer and internet. A previous cross-country examination of Kenya and Nigeria showed that the initial investment cost of end-user equipment limits the ownership of computers, compelling students and their teachers to seek internet access in cybercafés and other public places[22]. This supports our finding that most students had access to the internet in cybercafés and only few students-owed computers. Although the demand for internet connections in Nigeria (like other sub-Saharan countries) is rising, Nigerian consumers are now known to be paying 50-500 times more than an American for an equivalent connection. Most universities are therefore unable to pay for the bandwidth they need to make efficient use of online resources on their campuses[23].

Over 95% of the students have mobile phones and may access the internet through the mobile phone network but at 10 to 100 times higher than the cost in cybercafés or elsewhere hence most students would usually not use mobile phones for routine internet access as found in this study. Within the university communities, internet speed is often faster during early morning and after school hours than during school hours due to lower network traffic during those periods. For our pharmacy students, lectures and practical classes occupy majority of their time during school hours. These can explain the preference for using the internet after school hours. Whereas there was a proposal then that students in our university will be paying as much as ₦5,000.00 (US$39.81) per semester to have continuous access to internet on campus, our finding indicates that the pharmacy students studied were only willing to pay about ₦1,000.00 (< US$8.00). This has a limiting effect on access to the LMS when deployed.

Problems of access to computer facilities

The use and deployment of ICT in Nigeria has been largely an urban and upper-class activity[24]. Like in other sub-Saharan African countries, access have been identified to include high costs and low capacity; bandwidth cost is still about 100 times the cost in United States with payment of as much as US$2,500.00 – US$3000.00 for 1 Mbps per month[22, 23]. With an estimated gross national income per capita of US$882.00 in 2007 (http://www.exim.go.th/doc/research/targeted_country/7726.pdf)[25], and human development index ranking of 75, the poor financing of education by the Nigerian government and the ability/ willingness of university students to pay the cost of providing computer facilities could

account for the inadequate facilities identified by the students. Not surprising, electric power interruption for several hours each day or even days has been a frequent problem for several years in Nigeria and is usually a major problem for consideration when thinking of the use of computer facilities in the country. Although there are now many computer experts in Nigeria, majority of the students consider personnel as a constraint probably because of the present general attitude to work in terms of maintenance of facilities and service delivery. It is not surprising that the internet speed has been identified as a problem by the students. For many of the internet access points in the country, shared bandwidth as low as 125Kbps is used for as many as 5 to 10 computers running on Pentium III Intel celerion processors.

Perception of e-Learning in pharmacy education

Learning management system (LMS) is a virtual learning environment (VLE) software-based learning system designed to help teachers by facilitating the management of educational courses for their students, especially by helping teachers and learners with course administration.[13] Since the late 1990s, its utilization for web-based instruction has steadily increased in higher education.[26] It is now widely utilized in many developed countries by large associations, education providers and employers in healthcare.[26] In pharmacy education in UK, USA, Australia, Canada and many other countries, LMS is widely used for both undergraduate and postgraduate education and for mandatory continuing education programmes for pharmacists. Other than improving students' satisfaction with problem-based learning, the use of e-learning technologies have been demonstrated to improve performance in exams, and increase self-efficiency. [27, 28]

In this study, high interest of the students in the application of e-learning in their training was identified and cannot be unconnected with the demonstration of the features of the learning management system (LMS) and previous knowledge acquired from their lectures. Nearly all the students (92.7%) believed that LMS would be useful when combined with lecture notes provided in class most likely because they became aware that the features of LMS would provide a more friendly and supportive environment for learning. While believing that the application of e-learning will make learning more exciting and effective, the students' perception on sustainability is also an added advantage. This has a major advantage in implementation of LMS for the students.

The result of this study is being applied in to develop an LMS for teaching in Faculty of Pharmacy, University of Benin. Presently, the students are excited but the current limitation on accessing our current server from their homes is being addressed by the purchase of electric power backup diesel generator.

Conclusions

This study has shown that only a very small number of students in pharmacy owe computers and have access to internet outside cybercafés. Problems of utilizing ICT facilities by the students include lack of steady electric power supply, inadequate computer facilities, personnel, internet speed and affordability of the services. The students are enthusiastic about the application of LMS. Since there was no significant difference between those who wanted the LMS applied to all courses and those who wanted it applied to only limited courses, its application to all courses will be determined by the progress and success made in selected courses.

We will utilize this information in deploying the LMS to improve teaching in learning for pharmacy students while paying attention to developing an integrated system that will allow students in sister institutions to benefit from our experiences.

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