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SOWING THE SEEDS FOR IMPROVED PHARMACY EDUCATION IN NIGERIA: DEVELOPMENT OF ICT AT UNIVERSITY OF BENIN FACULTY OF PHARMACY

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Abstract

For today's pharmacy graduates to function effectively in an ever increasing technological world, pharmacy students must be trained to use computer facilities as they will always encounter the application of computerized information resources throughout their educational and professional lives. Similarly, pharmacy teachers need to be adequately proficient in computer usage in order to be able to apply computers in instructions and research. The purpose of this article is to describe the impact of the application of information technology (IT) on the training of pharmacy students in University of Benin Faculty of Pharmacy as well as explore the willingness of pharmacy instructors to embrace IT. A computer teaching laboratory, equipped with 20 computers, a server, printers, scanners, Laptop, and computer-aided learning (CAL) packages was developed. Internet access was provided through a local area network. Staff (n=30) and students (n=115) were trained to use the facilities. Self-administered questionnaires directed at both the staff and students trained were used to evaluate the success of the project. The level of computer literacy of academic staff increased from 60.8% (prior to the training) to 98.04%. There was a remarkable improvement in their computer skills. The staff agreed that the training greatly improved their abilities to teach and carry out research. All the students agreed that the computer education was beneficial 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. The enthusiasm of staff and students in the Faculty has been overwhelming. Computer facilities for the teaching of pharmacy students have been successfully developed and applied to improve computer literacy for both staff and students in University of Benin Faculty of Pharmacy. These have opened opportunities for improvement in research, teaching and learning.

INTRODUCTION

The practice of pharmacy was revolutionalized in the 20th century with the advent of "pharmaceutical care" as defined by Hepler and Strand¹. Pharmaceutical care describes a model of practice in which the patient is the primary focus^{2, 3}. For the pharmacist to actively participate in the delivery of pharmaceutical care, he/she needs to acquire a number of different attributes other than the ability to recall factual knowledge. Problem solving skills and a

holistic appreciation of the patient are indispensable³.

The application of classroom teaching is an important process in the development of skills and attributes required by pharmacy undergraduates. However, many universities in the United Kingdom, have applied innovative approaches to undergraduate teaching and a number of different methods of teaching have been adopted. Some examples include the use of internet-based teaching at Leicester⁴, the use of simulated clinical

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environments at Aberdeen⁵, and multidisciplinary pharmacy and medical student education at King's College London⁶.

The recent introduction of Doctor of Pharmacy (PharmD), which is being pioneered in Nigeria by the University of Benin, demands innovative strategies and skills required to prepare pharmacy undergraduate students to attain the expected professional skills and responsibilities in the provision of pharmaceutical care. New responsibilities for University of Benin in this respect include taking a leadership role in integrating information technology into the education of undergraduate pharmacy students. The skills acquired from such training will enable the students to focus their attention on developing analytical and problem-solving techniques that will provide the framework for life-long learning skills⁷. As today's pharmacists will always encounter the application of computerized information resources throughout their educational and professional lives⁷, computer education for undergraduate pharmacy students will prepare the pharmacy graduate to function effectively in the complex technological world of the 21st century.

The purpose of this article is to describe the impact of the application of information and communication technology (ICT) on the training of pharmacy students in University of Benin Faculty of Pharmacy. The responsiveness of pharmacy teachers to ICT was also explored. Being the first institution in Nigeria for training pharmacists to adopt ICT as part of the approach to improve the training of pharmacy students in Nigeria, we hope that the gains of this project will be applied by other Faculties of Pharmacy in Nigeria to improve the quality of their graduates. This will hopefully lead to the production of pharmacists in Nigeria who will be able to offer effective and efficient pharmaceutical care to patients.

MATERIALS AND METHODS

We developed a computer teaching laboratory christened "e-learning Centre, Faculty of Pharmacy" with a grant from the United States Government through its Embassy in Nigeria supplemented with funds from University of Benin. The facilities provided at the Centre include

- 20 nos. computers (Pentium IV Intel MMX 2.0-2.4 GHz processor)
- 20 nos. 600VA uninterruptible power supply (UPS) for electricity backup in case of electric power supply interruption and a backup 7 KVA generator.
- One dedicated Compaq Proliant ML 330e Server
- One Compaq Evo N1015v computer notebook
- Internet access through one of the three VSAT facilities available within the main campus of the University
- 2 nos. HP 1300 printers and 2 Mercury scanners
- Computer-aided learning (CAL) packages in anatomy, pharmacology (theory and practicals), physiology, pharmaceuticals, pharmaceutical microbiology, pharmaceutical chemistry, biology, epidemiology, pathophysiology and therapeutics. Most of all the CAL packages were acquired and licensed to the University by the Pharmacy Consortium for Computer Aided Learning (PCCAL), University of Bath, Bath, UK.

All the computers were linked through a local area network and connected to the University network. Running on a licensed Windows 2000 server, the Compaq Proliant server provided file service, enabling both staff and students to store information in the server. It also provided high-speed internet sharing and control. Access to the internet and the CAL packages enabled the students to undergo independent and group learning.

Training programmes

A four-week computer training programme was organized for 30 academic staff of the Faculty. The training covered basic skills in computer for the 10 staff who were not yet computer literate, and advanced computer training for the other staff. Areas covered in the training included working with Microsoft Word, Microsoft Excel, Databases (Microsoft Access), Powerpoint presentation as well as handling of images, basic website design (for creating web pages for lectures), using Microsoft Frontpage, drawing of chemical structures using ChemDraw, working on a network including file service, making use of Internet for academic information and using the CAL software. Also 115 pharmacy students in the second professional year of the six-year PharmD programme were taught basic computer skills including word processing, working with spreadsheet (Microsoft Excel) and internet, applying both laboratory and classroom teaching over a 2-month period (6 hours a week).

Evaluation

The success of the staff training was evaluated using a Likert-type scale in a pre-tested self-administered questionnaire with 21 closed questions in which each staff who participated in the training was asked to rate his/her ability to use each of the applications applied in the training before and after the training. A rating scale of 0 to 4 was used where 0, 1, 2, 3 and 4 implied that the staff was not able to carry out, fairly able to carry out, was good in carrying out, or was very good in carrying out, respectively, the specific function using the computer. In addition, the questionnaire also included information on the impact of the training on their abilities to teach and carry out research.

An online database accessible through active server pages was used to evaluate the impact of the training on the students'

learning ability. A Likert-type scale of 1 to 5 (where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree) was adopted in a pre-tested questionnaire with 14 closed questions in the following domains: (i) active experimentation (ii) abstract conceptualization, (iii) information sourcing, (iv) interaction, (v) professional impact, and (vi) problem-solving. All 115 students (100%) who were trained responded to the questionnaire.

Data analysis

The questionnaire manually administered to the staff were entered in a computer database, Microsoft Access (Microsoft Corporation, USA) and double-checked before analysis. The descriptive statistics of all data, including those from the electronically administered questionnaire, were analysed using Microsoft Excel (Microsoft Corporation, USA).

RESULTS

Of the 51 academic staff in the Faculty of Pharmacy, the computer training for the 30 staff increased the level of computer literacy of academic staff from 60.8% (prior to the training) to 98.04%. There was an overall improvement in the level of computer literacy of the staff who were trained. The staff rated their level of literacy from a mean score of 1.1 ± 0.15 before the training to a mean score of 2.5 ± 0.25 after the training. The impact of the training was generally good as 83.5% of the staff had sufficient knowledge to be able to carry out their academic activities with the computers with minimum assistance. Apart from improvement in the ability to use the word processor more effectively, 66.7% of the staff were able to effectively utilize the multiple recipient merger function through integration with Microsoft Excel. Most of the staff (70%) intended utilizing Microsoft Excel in their research and routine office work and expressed much excitement at the functions

available in the program. Generally, the staff agreed that the training greatly improved their abilities to teach and carry out research.

The rating of the impact of computer training on education of the students who responded is given in the Table I. The 115 students who had each undergone 2 months computer training gave an overall average rating of 4.12 ± 0.85 (95% confidence limit: 4.07 – 4.17) on the rating scale of 1 to 5. Apart from interaction of students with lecturers which was rated not to have improved (2.93 ± 1.07 ; 95% confidence interval: 2.71 – 3.16), the students (respondents) agreed that the computer education was beneficial in improving learning, professional competence,

team work among students, problem-solving ability and self-confidence, as well as acquiring new knowledge and opening opportunities for life-long learning.

The computer facilities provided have opened many opportunities for both staff and students and even people outside the University community who have been coming around to request for one form of training or another. Staff and students training, Computer Aided Learning, access to Online Information, access to local lecture materials stored in their folders by lecturers, Computer File Service, and Online Questions Database (local) are opportunities open to staff and students, particularly in Faculty of Pharmacy.

Table I: Rating of the impact of their computer training by students
(1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree)

Factor	Rating (mean \pm sd)	95% confidence limit of rating
Active Experimentation:		
1. Able to acquire and apply new knowledge	4.48 \pm 0.59	4.35 – 4.60
2. Can now use Internet to improve self-study skills	4.39 \pm 0.61	4.26 – 4.51
3. Opportunity for self-initiated training and development increased	4.15 \pm 0.74	3.99 – 4.30
Abstract Conceptualization:		
4. Now understand lecture notes better because of computer-aided learning programs available	4.01 \pm 0.80	3.85 – 4.18
5. Now understand lecture notes better because of lecture materials available on Internet	3.92 \pm 0.79	3.76 – 4.09
6. Learning skills increased	4.24 \pm 0.71	4.09 – 4.39
7. Now motivated to research	4.23 \pm 0.72	4.08 – 4.38
Information Sourcing:		
8. Ability to easily source for educational materials increased	4.36 \pm 0.68	4.22 – 4.51
Interaction:		
9. Team work encouraged among students	3.78 \pm 0.99	3.58 – 3.99
10. Able to interact more with lecturers	2.93 \pm 1.07	2.71 – 3.16
Professional Impact:		
11. Will improve professional competence	4.44 \pm 0.62	4.31 – 4.57
12. Self-confidence increased	4.25 \pm 0.70	4.10 – 4.40
13. Opens opportunities for life-long learning	4.43 \pm 0.64	4.30 – 4.57
Problem Solving:		
14. Problem-solving skills and ability to manage multiple tasks increased	4.03 \pm 0.88	3.85 – 4.22
Overall impact	4.12 \pm 0.85	4.07 – 4.17

With the file service provided, students and staff are able to store their information in their secure folders. Staff can now set multiple questions and store in a central database setup in the server. Furthermore, the database has been integrated with active server pages to administer online assessment tests in a computer course for the students. Using this approach, grading of continuous assessment tests based on multiple choice questions and questions with defined answers is being done automatically by the computer. As appropriate, each student is able to know his/her performance in continuous assessment tests in computing as soon as the assessment test is concluded. This has made life 'easier' for both the lecturer and the students. From an interview conducted with the 115 students, this online assessment is preferred to the manual administration of questions.

DISCUSSION

The profession of pharmacy has continued to expand its involvement in patient care through the precepts of pharmaceutical care. In doing so, many structured programmes have been implemented to enhance the outcomes of patients at high risk of developing drug-related problems⁹. Retail pharmacies in developed countries like USA and Europe now use computers to evaluate drug interactions, provide interactive patient education materials and track medication compliance, in addition to prescription management and billing¹⁰. In Nigeria, more and more emphasis is now being placed on computers and their interactions with health care. At the University of Benin, unlike most Nigerian universities, we have seen a dramatic shift towards computerization. This includes the recent introduction of internet-based admission processes, registration of courses, payment of charges, clearance of admitted candidates, results publication, etc. With internet facilities available in academic units and students' halls of residence,

incorporation of computer technology in education is gaining ground. Academic staff and students are finding themselves increasingly faced with the challenges of becoming adept in the application of computer systems and knowledgeable about their capabilities and limitations. These have opened opportunities for the application of computer technology in the education of pharmacy students.

From a rather crude form in the early days of civilization to the vast array of computer-technology driven modern devices, technology has significantly impacted on educational theories and practice. Computer technology incorporates tools and materials that present, support and reinforce teaching and learning. Since pharmaceutical care requires the application of computer technology in most areas of practice including drug information, professional dispensing of drugs, patients' records of drugs utilization, drug management, etc, computer training is being applied to students in the recently introduced Doctor of Pharmacy programme at the University of Benin with the hope of improving the overall training of the pharmacy students. We have approached this through the acquisition of the computer facilities and training of both staff and students. The training has not only effectively increased the proportion of staff who are computer literate in the University but also improved the skills of the staff in computing and the ability of many of them to effectively carry out their research and teaching. This has a multiplier effect in the entire University and definitely impacted positively on the training of pharmacy students by lecturers.

The enthusiasm of staff and students in the Faculty of Pharmacy has been overwhelming. Students' general agreement that the computer training they received improved their active experimentation ability, abstract conceptualization, information sourcing, and problem solving skills is

encouraging. Thus, we have successfully introduced innovation in our educational system by putting in place a system that encourages creative thoughts among students. It is not surprising that the students disagreed that there was any positive change in their level of interaction with lecturers. Many lecturers do not currently have direct access to computers in their offices and the students e-mail service has not been activated at the time of this study. We expect that the level of interaction will increase dramatically when the mail server for students is activated and both students and staff are properly educated on the use of the facilities to enhance interaction. The expected improvement in the professional skills of pharmacy graduates who are computer literate and the opening of opportunity for life-long learning is an indication of better training for the students.

The use of online questions for evaluation is not new. Here in Nigeria, the approach is being applied for the first time in a Nigerian University. While eliminating the need for manual time-wasting grading of scripts or the need for other electronic devices for easy marking of scripts, the approach reduces delay in the release of results. Although limited by the need to have sufficient number of computers available for this type of examinations, multiple choice questions can be applied at all levels, particularly university common entrance examinations, using the online process.

CONCLUSION

We have successfully developed computer facilities for the training of pharmacy students. The facilities have been successfully applied in improving computer literacy for both staff and students at the University of Benin Faculty of Pharmacy. These have opened opportunities for improvement in research, teaching and learning.

The project is now widely acknowledged as a major achievement in University of Benin Faculty of Pharmacy and, in fact, the entire University. Staff and students of the Faculty and other staff in the University are benefiting immensely from the facilities. Pharmacy students are now being better trained to be able to provide professional services to the public when they graduate. The facilities have not only increased the confidence of pharmacy students within the University but is also preparing a better future for pharmacy graduates of the University of Benin to be better to meet the challenges of pharmacy practice.

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