Chapter Eight

Setting up and Managing an ICT Interactive Laboratory for Learning and Teaching at a Nigerian University

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1. Introduction

The University of Jos has a population of over 20,000 full time students. Most first year science courses are heavily subscribed. This makes it difficult to split students in these classes into small enough groups for meaningful staff-student interaction. In addition Staff Student ratios are poor. Such challenges are reasons for poor performance of new entrants. Using technology to facilitate and enhance the process of teaching and learning is a solution under experimentation.

Each time we need to set up and manage an Information and Communication Technology (ICT) laboratory, it is necessary to shop for new ideas on how to control the potential abuse of facilities and protect users' interest for a pleasurable lab experience. Setting up and managing a computer lab in the University of Jos environment, requires that rules and regulations must be well articulated so that they can be easily adopted and adhered to. Issues, ranging from security to operational hours for the lab are considered critical to the successful implementation of the set up plan and the running of labs on a day-to-day basis. For a lab to be useful, certain additional facilities and tools such as power supply, cabling, security arrangements etc; which are often neglected at the planning stage must be made available. When the basic infrastructure is provided, and the users know what to do and what not to do, the chances for a poor lab experience are reduced and the users can perform optimally. The survey method used for investigation included questionnaires and interviews, essentially to determine users perception of what an ideal lab should be designed and administered. Some labs were observed. The sample population size of 40 was used with an 80% response rate. The findings provide the guidelines of how an ICT lab should be setup and run on a day-to-day basis. Difficulties and problems experienced and how they were surmounted are discussed. Ideas generated in this exercise provide a guideline for setting up and managing an ICT interactive lab. A checklist is provided to assist those intending to set up a laboratory. The exercise reveals that a lab set up with a well-articulated plan adds value to institutional learning initiatives and promotes best practices.

2. The problem

ICT has been defined as a broad spectrum of technologies that allow users to get, produce, and share ideas and resources (Paul, 2008).

A digital lab has been defined by (Graham, Paul, Roger and Elizabeth 2005)., as a network of computers, plus appropriate software, which provides most of the functions of a conventional (analogue) language lab together with integration of video, word-processing and other computer applications. A digital lab has many benefits and some of these benefits have been enumerated by Graham (2008), who observed that benefits outweigh its downside. However, we observed, similarly to Roxana (2009) that we often dwell on the deployment of ICT and we often neglect the lab that houses the hardware and the software that make up the computer system.

A digital lab has become a must-have in many institutions of learning. It is the bedrock upon which present and future knowledge stands and thrives. It could be a resource base for the institution in which it has been setup. Many interactive labs in Nigerian institutions lack the basic infrastructure to provide facilities expected in an ICT lab. Examples of these are – adequate power, connectivity, security of hardware and software to mention just a few. When labs are not properly setup, they are unable to provide the experience users wish to have while working in a lab. Many labs in Nigerian education institutions are criss-crossed with wires (see Fig.31); they have low internet bandwidth and lack adequate facilities for pleasurable lab experiences .

In   some   labs,   movement   is

Figure 31: A criss- crossed network cable before the study. Courtesy ICT Directorate

difficult due to poor arrangement of furniture and equipment. Such arrangement does not support the quick exit necessary when there is an emergency (see Fig. 32).

Figure 32: Example of badly arranged furniture and equipment. Courtesy ICT Directorate

In times of accidents such as fire, it becomes difficult to handle the exit of people and equipment. Power (energy) supply is intermittent and unsteady as extension cables plugged to sources of power, pose additional challenges.

After a review of all these avoidable inadequacies observed in labs, a study of the experiences of the Technology for Teaching (TfT) Mathematics team, led by Professor Liverpool, in setting up an ICT Mathematics interactive laboratory was made. We have thus learnt how to overcome difficulties, contributing to the slow adoption and adaption of ICT in Nigerian HEIs. As a result we are proffering solutions to assist Nigerian HEIs that intend to set up ICT interactive Laboratories. We share the experiences of the TfT Mathematics team, in setting up and running an interactive lab.

3. Context

Jos city, Nigeria in which the University of Jos (UniJos) resides was founded in 1915 as a tin mining camp and is the capital of Plateau State in central Nigeria. The University of Jos became a full-fledged university in 1979 Under Decree No. 82 of 1979. The University hosts eight academic faculties: Arts, Education, Environmental Sciences, Law, Medical Sciences, Natural Sciences, Pharmaceutical Sciences and Social Sciences; with over 40 departments spread across two campuses. It has a school of Post Graduate Studies. The total students' population stands at over 20,000 with well over 800 faculty members.

Many ICT labs at the University of Jos were not well organized as depicted in figures 19 and 20 above and this increased the need for reorganization. Support was received from various external funders such as Carnegie Corporation, Hewlett Packard (HP), and World Bank (Science and Technology Education Post-Basic). This support helped the TfT Mathematics team at the University of Jos to create an ICT lab of a high standard with Tablet PCs. In order to secure the lab, the following security measures were put in place:

i) Each student was permanently allocated to a PC on which their information was stored.

 ii) Students' photographs were taken and stored on each PC to facilitate identification of student mapped to a particular PC. This was done to ensure that each student takes ownership of the system assigned and to ensure that it is always in good working condition.

iii) Students were not allowed into the lab with their bags.

iv) The use of cell phones was disallowed while in the lab to minimize disruptions.

To resolve the electric power (energy) problem which is a critical challenge in Nigeria, a solar energy, battery and inverter hybrid, powers the Tablet PCs and projector, during power outages (Fig 33).

Figure 33: Batteries, Inverter and Solar Panels-Courtesy TfT Team

4. The Jos experience

An interactive ICT laboratory had to be put in place in order to achieve our plan of facilitating and enhancing the process of teaching and learning. A well-resourced lab is the basis for this. However, one of the main challenges was limited budgetary provisions from the university. Therefore, support was garnered from Carnegie Corporation of New York, Hewlett Packard Technology for Teaching project, and the World Bank assisted Nigerian Science and Technology Education Post Basic (STEPB) project, to commit funds to assist in addressing this need. The University provided a building which was renovated for use as an ICT interactive Lab that currently houses Tablet PCs, a server, printer, projector and network accessories. Funds from the Carnegie Corporation were used for the training of staff and students, through overseas attachments as well as for local seminars and workshops. ICT consultants from the United States and the United Kingdom as well as local experts were engaged to support this initiative. In addition, these organizations supported with Tablet PCs, printers and accessories such as network cables, tables and chairs.

To effectively maintain the equipment, and for project continuity; one member of the TfT Mathematics team was trained in engineering management at the Santa Clara University in the United States of America and is training others, now that he has returned to the department.

Pilot classes comprising students from mathematics and other departments were set up and experimented with. With the learning and teaching resources, including the installed HP tablet PCs in our lab, the pilots show that good teaching by staff and improved assimilation by students have been facilitated. The TfT Mathematics experiment with using Technology for Teaching shows that if well planned; students will perform better when technology is used to teach in a blend with face-to-face activities. Technology has the capacity to change the way we plan our classes. The blended approach in use indicates that classes have to be carefully planned and pruned to a manageable size. This approach in turn, leads to higher rate of assimilation by students with a domino effect on knowledge gained by learners. Survey results from the pilots indicate that students who participated in classes using technology performed better than those that participated in the face-to-face classes without technology.

The interactive lab is used for teaching first year Mathematics and other courses in the sciences. Fig. 34 represents the product of this initiative spearheaded by the TfT Mathematics Team led by Professor Liverpool of the University of Jos, Nigeria. The power back up arrangement showed in Figure 33 is judged imperative in the current Nigerian environment, for a functional interactive lab.

Figure 34: Newly Designed Interactive Lab at UniJos-Source TfT Maths Team

5. Methodology

In this study, the investigative method employed was the survey method. It included the interview of users and other persons whose services are critical to the success of the design and management of an interactive lab. Questionnaires were administered to elicit information from stakeholders made up of staff and students. During this process, relevant questions were asked and answers documented.

The objective of this study therefore, is to come up with the requirements for setting up a functional ICT interactive lab that will enhance teaching and learning. The check list does so and will continue to be improved upon as technology changes.

Labs in institutions around the focal point of the study, the University of Jos, were visited. They include Bingham University, Karu and Gombe State University, where ICT labs exist. Stakeholders in these institutions were interviewed and results of the interviews documented.

The third and the main instrument that was employed is the questionnaire. The questionnaire used the Likert scale (Trochim, 2006) for the assessment of lab experience by users. There were 40 questionnaires distributed with a response rate of 80%. This small sample population was constituted from those that are committed to seeing changes in our labs.

The questionnaire was made up of 46 questions and divided into seven (7) sections namely 1) Security 2) Lightning in the lab 3) The Lab manager 4) Lab facilities 5) Seating arrangements6) Lab conduct and 7) Sources of power to the lab

6. Findings

6.1 General: Sixty-two percent of the respondents were males while 38% were females. Of the respondents, 31% were staff members and 69% were students. The results of data analysis reveal that much is needed to be put in place for lab users to be comfortable and enjoy a pleasurable experience.

It was noted that labs vary in many ways. Facilities available in the labs differ from institution to institution. For example, some labs have adequate and conducive seating arrangements while others do not. We observed that some have adequate sources of power and good internet connecting points while some others were not so lucky. We felt that observing these facilities and documenting experiences at these sites were critical to the success of this study. This has impacted on our conclusion. The questionnaire analysis was done using SPSS package

A discussion of findings for each section of the questionnaire is provided below:

6.2: Lab Security: It can be clearly seen that for the safety of items in the Lab, it is desired that secured door should be provided in addition to the use of security guards and burglar proofs with bar codes installed if funds are available. It was also noted from result of the survey that users prefer that the floor be tiled as against carpeting so as to reduce the incidence of static charges that may destroy data held on magnetic surfaces. Users supported the deployment of close circuit cameras but disagreed with having users' pictures displayed on systems. Users also supported the installation of software that can monitor the way a particular system is being used. The Labs should be fire proofed or have fire extinguishers installed at strategic places in and around the premises to forestall any form of fire outbreak. Users agreed that the lab be earthed to prevent thunder strikes damaging equipment.

6.3: Power source in the lab: users supported the mounting of sockets on the wall and on tables rather than on the floors. They also supported the use of standard stabilizers and other forms of power backups that will keep the system running in the event of power outages - a common occurrence in Nigeria.

6.4: Engagement of Lab Managers: users supported the need to employ either a qualified engineer or an administrator or better still, someone with both administrative and technical experience. It was suggested strongly that the office of the Manager should be inside the lab to facilitate monitoring of all activities in and around the lab. It was suggested that lab managers should be supported by interns for the effective running of the labs. It was also suggested that the Lab manager checks each system after every lab session, as

that will ensure that systems are always in good working condition. Suggestion boxes are to be placed in labs to harvest inputs that will improve lab use.

6.5: Lab facilities: users preferred a lab with wireless internet connections rather than a wired networked lab. Wired connection has the potential of making the environment clumsy and untidy. They also supported the installation of video conferencing equipment, public address systems and filters to monitor access by users. Network printers are desirable to be in the lab to facilitate printing needs. Projectors should be installed in the lab to facilitate the delivery of lectures. Original software is to be installed in all systems at the lab to reduce the incidence of computer virus. Ventilation was identified as a critical need in a lab for the wellbeing of equipment and users.

6.6: Seating arrangement in the lab: users agreed that each system should be fixed on a table, but they disagreed on users having permanent seats. They however agreed that seats should be arranged in such a way that users sit side by side, to enable them share ideas and resources.

6.7: Conduct in the lab: users agreed that noise making should be disallowed as well aseating, drinking and chewing of gum. In a way of securing the lab, bags should not be allowed into the lab and when a user has any difficulty, a raised hand should attract the attention of the lab manager. All arrangements in the lab must not be tampered with by users and personal computers of users should be disallowed in the lab. Users agreed that logs should be used to record and monitor access and lab time should be assigned to every user to enhance time management and ensure that every user has opportunity to use the lab.

6.8: Power source to the lab: it was agreed that labs must not rely on electricity supply from the national grid but should, in addition, have backups that can supply enough power for a fairly long time when a power challenge is experienced.

7. Checklist

From the above, we derive a check list of the minimum must-haves in a lab which are now listed below under subtitles earlier identified.

7.1: SECURITY

1. Secure the lab with lock and key
2. Depending on location, engage the services of security guards
3. Ensure that the floor of the lab be tiled, fibre carpets should be avoided to reduce the incidence of static charges
4. Where funds are available, close circuit cameras should be installed
5. Software that could monitor systems' use should be installed
6. The building must be well earthed against thunder strikes
7. Lab should be fire and burglar proofed
8. Bar codes may further be used to secure the lab

7.2:POWER SOURCES IN THE LAB

9. Adequate sockets (power outlets) should be mounted on the wall and on tables
10. Standard stabilizers are to be installed to regulate and stabilize power output to systems
11. Power backup must be in place to take care of power outage if any
12. Adequate lighting points must be provided to cater for the capacity of the lab.

7.3:LAB MANAGER should:

13. Be a qualified Engineer (Technician) who will ensure that hardware systems are in good working condition always or
14. Be an Engineer with some administrative experience
15. Have an office within the lab and not without
16. Have Interns engaged to assist the lab manager
17. Check every system before and after use to ascertain that they are all in good working condition before the next use
18. Have a suggestion box as a way of receiving ideas for constantly improving the lab. Or better still a forum, using technology to share ideas on how to improve the lab should be in place.
19. Be assisted by interns to admit students into the lab.

7.4: LAB FACILITIES

20. The building housing the lab should be internet ready using wireless technology.
21. Video conferencing facilities is desirable in the lab
22. Filters are to be installed in the lab to monitor access by users
23. Network printer should be installed for printing by users

24. Projector is desirable in the lab to facilitate delivery of lectures
25. Original software are to be installed on systems to reduce the incidence of virus propagation in the lab
26. Lab should be well ventilated.

7.5: SEATING ARRANGEMENT

27. Systems are to be permanently fixed on a table to avoid being interchanged or moved by users. As moving them about could distort seating arrangement.

28. Tables and chairs should be designed in such a way as to encourage the sitting of users side by side so that ideas could be shared amongst users

7.6: LAB CONDUCT

29. Noise making, eating, drinking and chewing gum should be disallowed in the lab

30. Users should not be allowed to come to lab with a bag.

31. Users facing some form of difficulty should indicate such by the raise of hand to attract attention of lab staff

32. Users should not be allowed to tamper with lab setting/arrangement

33. Logs should be used to monitor usage

34. There should be time schedule for every user allocated through time scheduler to avoid conflict in the usage of lab resources.

7.7: POWER SOURCE TO THE LAB

35. Backup must be put in place.

36. Current entering the lab must be constantly gauged and rated so as to ensure that surges are avoided

37. The lab should be connected to the national grid in addition to the solar panels currently being used

8-CONCLUSION

This study has helped in identifying some critical issues that are often neglected but which must be tackled while planning an ICT interactive lab in a developing country such as Nigeria. These issues have been enumerated in the sections above. Our institutional experience has also shown that, Technology for Teaching is the way of the future and that Nigerian HEIs must continue to engage partners in the developed economies for funding

supports. We observe from the output that, the way to go for now is the blended e-learning - using technology side by side with face to face delivery of classes. Our experience has also shown that blended e-learning can be delivered, teaching smaller classes at a time as most Nigerian HEIs do not have the resources required to effectively engage a large number of learners at the same time. The need for Nigerian institutions to share experiences with one another is evident as no institution has the capacity to do it all alone. For us at Jos, the little success we have recorded can be attributed to the prudent management of donors' resources which met their expectations. A well planned lab will add value to institutional eLearning initiatives and promote best practices.

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