

The Role of Information and Communication Technologies in Science Education: the Case of the Namibian College of Open Learning

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Abstract

The buzzword in communication today is technology. It becomes more relevant where distance, especially long distances apply.

In the case of Open and Distance Learning Institutions, technological development is crucial to ensure sustainability, oppose competition and manage threats. However, in the developing world, the financial implications of technological development become a serious challenge in endeavours to keep abreast of latest technology, but more so to innovate and lead technological development. Although it can be cost-saving when applied correctly, these technologies are very costly to acquire. Good collaboration among ODL institutions and the sharing of resources might be a viable option to address some of these financial challenges.

Namibia has three Government-subsidized ODL institutions, and a few privately owned institutions. Since our population is relatively small, there is not a big local market for ODL. This situation increases the risk of investments in technological development. This research intends to find out what the challenges of these institutions are and how best to address these challenges in the Namibian context.

Introduction

In this paper it is argued that ICTs play an important role in teaching and learning, in particular in Science Education. Both teachers and learners can benefit much from the exposure to ICTs and the opportunities they provide. ICTs have the potential to bridge the gap that exists in Science teaching and learning due to the shortage of teaching aids and equipment for experiments in the Science classroom.

In terms of exposure of its learners to ICTs NAMCOL has embarked on the following:

- Recordings of learning materials on tapes and CDs.
- Radio presentations on particular subject content.
- Cellular phone contact through SMS to get general information to learners.
- A Toll-free helpline for learners to get information amongst others on registration and examination fees, assignment due dates or make contact with the learner support office.
- Currently in this e-learning project- lessons are provided on CD-ROM and ultimately on the NAMCOL website.

The e-learning project is seen as a starting point for NAMCOL to take initiative and leadership in this area and hopefully support other similar efforts in Namibia and the region to expose learners and teachers to the value ICTs have in providing quality education

Background of the Institution and the Pilot Project

The Namibian College of Open Learning is a state-supported educational institution, which provides study opportunities for adults and out-of-school youth. NAMCOL has more than 25000 registered learners (NAMCOL Statistical Digest, 2004) for the Alternative Secondary programmes.

A pilot project on the use of ICTs in Distance Education was conceived in collaboration with the United Nations Educational, Scientific and Cultural Organisation (UNESCO). UNESCO will fund this project over a 15-month period, which aims to achieve the following:

- developing and delivering digital courseware in the target subjects (JSC and IGCSE Physical Science/Mathematics);
- compiling a comprehensive manual on the development of web-based courses;
- training tutors who can provide on-line support to learners; and
- pilot testing the digital courseware.

Terminology

Different definitions for Information and Communication Technologies exist, however, the following are presented:

“Information and communication technologies (ICTs) include any communication device -- encompassing radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning.” (Whatis.com, 2005).

E-learning “refers to using electronic applications and processes to learn. E-learning applications and processes include web-based learning, computer-based learning, virtual classrooms, and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM.” (Learnframe.com, 2005)

NAMCOL uses telephone, facsimile, radio, tape recording, cellular phone, computer hardware and software, Internet and e-mail to provide educational support services to its learners.

Based on the definition for e-learning, it can be stated that the project described in this paper is referred to as an e-learning project, since it aims to develop web-based learning materials. On-line tutor support services are provided in this project and all learners have their own e-mail addresses.

Methods

Data were mostly collected through document analysis. Data about the pilot project were captured in a manual, which was developed as the project unfolded.

The author of this paper was a participant observer and formed part of the project management team.

Questionnaires were used in the needs assessment and evaluation processes, like in the training programmes. Staff members (20) and learners (100) completed questionnaires to determine their levels of ICT skills before the training.

Interviews were held with selected staff members on their experiences in the project, after reflections were analysed as they were recorded in the manual.

The use of ICTs in Distance Education

The use of technologies in distance education has become crucial in the modern world as competition increases, while markets open to the world, as it becomes a global village. The quest for better qualifications and good employment positions drive people to equip themselves suitably through any possible means. Any institution that uses accessible technologies to reach its clients, while providing affordable education courses at the comfort of its learners, has a good chance to prosper and take a fair share of the market. Kendall and Van Weert (2005), agrees strongly in their study, which emphasize the growing importance of lifelong learning with ICT. It is thus

important to accept that such a project is most effective in building a nation-wide professional learning community, as was experienced by Trewern and Billowes, (2005).

Jenny Leach (2004:145) argues that: "teachers and schools in poor environments could benefit from the many advantages that ICT is currently affording richer peers, whilst leap-frogging expensive mistakes made in more developed countries. Mobile digital devices that have, to date, been largely aimed at the business market, can be exploited by teachers and students for a range of professional and learning experiences." The majority of NAMCOL's learners yields from the previously disadvantaged communities and are therefore relatively poor. This emphasizes the importance for the institution to go the 'extra mile' in providing access for its learners to alternative learning methodologies and exposure to ICTs. NAMCOL has made some strides in utilizing digital devices in its radio, cellular phone (SMS), tape recordings and other programmes, but needs more effort to ensure that these devices yield the expected results. Further, the institution needs to be at the cutting edge of the latest developments in access to technology for its learners. Such access should be utilised optimally to the advantage of learners.

Furthermore, it is most important to recognize the added value provided in allowing learners and tutors to involve themselves in dealing with electronic teaching and learning materials. Sakarias Iiping (2004), in his study of how technology transforms teaching and learning, emphasized the outcome of a series of research that proved that students who have access to computers at home tend to achieve higher scores. At this point, although the home computer market is gaining momentum in Namibia, it is still insignificant in terms of ICT needs for learners. Therefore institutions of learning and their partners have the responsibility to continually explore possibilities to introduce ICTs in education.

The Physical Science E-learning Pilot Project

Capacity Building

A consultant from the South African Institution for Distance Education (SAIDE) trained twenty NAMCOL staff members as part of this project. The training was intended to build capacity in the following areas:

- Computer skills
- The use of particular software programs:
- The development of web-based materials
- Content selection
- Developing content frameworks
- Writing storyboards
- Converting storyboards into web-pages

All staff members who participated in this intervention are well skilled in the use of Internet and e-mail.

The facilitator at NAMCOL's computer based learning center (CBLC) provided further ICT skills orientation to staff members and learners at centers.

Developing web-based materials

The Physical Science programme developer at NAMCOL was responsible for identifying content areas in Grades 10 and 12 Physical Science that would be focused on. Lesson frameworks were developed from the list of content areas identified. Six storyboards were then written from these frameworks for each of Grades 10 and 12. Afterwards the 12 storyboards were converted into web-pages by using Macromedia Dream Weaver and Flash.

The storyboards were copied on CD-ROM discs and distributed to learners for use during the pilot process.

The Piloting Process

NAMCOL selected five centers across the country to pilot the study materials on CD-ROM. Staff members have done this selection on the basis of the availability of and access to computers, as well as the provision of support. These centres are based in Windhoek, Oshakati, Katima Mulilo, Walvisbay and Keetmanshoop. Twenty learners at each center took part in the pilot process- ten for each of Grades 10 and 12.

Quality Assurance and Evaluation

The quality assurance team was responsible to develop quality criteria to assess the quality of the web-based materials. At first the criteria were used to assess the storyboards. Then the same criteria were used to assess the web-based materials. The quality criteria included the following areas:

- Content
- Instructional design
- Learner support
- Tutor support
- Connectivity
- The final product

It was a project requirement that detailed evaluations were done of each phase of the project.

Reflections by staff members and learners

Staff Members

Only three of the eight storyboard writers were former Physical Science teachers. This was a very challenging and time-consuming exercise. Therefore, the whole team did a thorough quality assessment on all storyboards, using the quality assessment criteria. Thereafter all storyboards were edited by content and language experts. During this period the staff members experienced varying emotional levels, feeling helpless at certain points of the process, but also felt the process was rewarding. Here are some reflections of staff members:

"It was time-consuming to search for web-sites on the Internet. To get the right picture for a certain page and to match with the text on that page was frustrating and time-consuming."

"Yes, to see my complete story on the board was rewarding. I could see how I have put into practice what I have learnt during the e-learning training. I have picked up many skills on the use of the computer and programs."

It is clear from these reflections that it was indeed a mentally challenging process. Although the spirit did drop at times, the good work ethic of staff members played a crucial role to complete the task in time. The fact that staff had to continue with their normal duties apart from this extra load increased the stress levels. At some points the progress was slow and additional motivation was required.

After completion of some storyboards and the quality assurance process and editing, the production unit could start converting the storyboards into web-based materials.

Learners

Learners were equally excited about this project. They expressed their appreciation to NAMCOL for this initiative. They valued the lessons on CD-ROM as expressed in the following edited reflections:

"The project here is going fine and I am enjoying it. Thank you, I wish you are going to give me more information. Good luck."

"I could go on with the training even for two months. We are enjoying the CD, it went on okay."

"I want to tell you how we study our Physical Science. In this subject I will have high marks and I know that I will go to Grade 11."

"I am very happy to get this CD. I promise that this year I will score a good symbol in Physical Science."

"The e-learning materials were very useful. The information in the CDs are very useful, because we are going to use it in the exams."

"The e-learning materials for Physical Science were on the right level for my studies. The CD covers very important topics in Physical Science, which I always wanted to improve my level of studies."

Success of the project

It is evident from the reflections of both staff members and learners that the project yielded much success. Apart from the frustrations and concerns expressed, especially by staff members, they experienced growth at the end and felt the experience was rewarding.

The project was well planned and every group or individual was clear of his or her role and competent to execute the task at hand. The partners in the project- management, the sponsor, the consultant, professional staff and learners- made serious commitments to make this project work. This was reflected in the dedication during meetings, planning sessions, training sessions, development of the materials and the enthusiasm of learners and tutors, while engaging with the content.

The learners were exceptionally happy and surprised and confident on the impact the project would make on their learning. This confirms that technology works very well with our generation of learners.

The tutors also expressed their experiences of the project. It was good to hear from one of them that; "I am learning a lot. It helps me improve my subject knowledge and the project is helping me to improve my teaching skills.

Similar expressions were made regarding the ICT skills orientation, where tutors improved their skills in using the computer and software programs.

Challenges

The challenges that NAMCOL experienced are not uncommon to other similar projects. Most projects that the college engage in, is dependent amongst others on the commitment and dedication of full time staff. There are no separate groups who give full-time attention to projects, apart from consultancies where expertise from outside are utilized. Even then, the college takes a management role through its full time staff members.

Like in any distance education programme, tutor support is vital in the e-learning project. On-line tutors were trained to respond to the needs of learners and be proactive on expected requirements from them. However, the process did not necessarily unfold as expected by the management team. Some learners experienced difficulty to make contact with the on-line tutor and didn't get the feedback in the timeframe expected. Other learners did not make use of their e-mail facilities to make contact with on-line tutors. This is an area where additional effort is required to make it work.

Conclusion

It appears that the project thus far was a resounding success. Staff members did well in overcoming their fears and frustrations and completed the project within the required timeframe.

The final product also met the expectations of the management team and learners expressed their satisfaction with the CD-ROM and the materials. Final corrections and editing is done on the materials before it is launched and posted on the websites of NAMCOL and UNESCO for further use by educators and learners.

I look forward to the further development of web-based materials in Namibia and elsewhere in the region. It is my wish that this paper will attract attention of science educators and researchers to engage in the debate of the use of technologies and find ways to improve the quality and standard of teaching and learning for all teachers and learners.

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