The Use of ICT for Teaching in a Poor Resource Setting

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Abstract: South Africa, like many countries in Africa is plagued by issues related to lack of bandwidth and in many of our rural districts there is no infrastructure for any kind of internet connection. One of the key objectives of the MEPI programme (Medical Education Partnership Initiative) is to be able to conduct de-centralised teaching to medical students in rural hospitals via video conferencing. These students are normally doing their community service and have no contact with their lecturers. The role of Computer Education and Information technology is key to the successful implementation of the UKZN MEPI ENTRÉE programme. The IT provisioning involves the setup of infrastructure and the rollout of an effective video conferencing system that would facilitate decentralised teaching and learning. IT. The IT brief also entails the planning and rollout of an E-Learning platform to further enhance the effectiveness of the programme. Given the demographic diversity and lack of adequate IT infrastructure to support such and elaborate objective, IT will have to find innovative ways to overcome these challenges.

1 INTRODUCTION

The ENTREE program plans to use various innovative strategies to achieve its aims of student and faculty capacity development and staff retention. These include the use of an established, validated, University and Department of Education approved, postgraduate curriculum in HIV management. This programme will be adapted for delivery to medical, nursing and pharmacy students. The plan is to attract a select group of medical students to concurrently enrol in a parallel research-driven programme as a novel approach to developing a cadre of academic and research staff who are likely to be retained in and contribute significantly to this field. The University of KwaZulu-Natal is one of the leading centres for HIV/AIDS and TB research on the continent and has been associated with many recent breakthroughs in both the basic science and clinical management aspect in the field. It is ideally poised in achieving the aims of the programme having already graduated co-registered medical students in basic science higher degrees. In addition, changes to the medicine curriculum have seen the acceptance of many students with a research background into the undergraduate medical programme which include both Honours and Masters students. While such students are a minority, they potentially serve as an existing cohort in implementing the goals of this programme.

2 INFORMATION AND COMMUNICATION TECHNOLOGY (ICT), A TEACHING TOOL

Information and communication technology (ICT) is now recognised as a rapidly emerging powerful educational medium with innovative methods to allow global dissemination of information. (1) (Taylor et al., 2008). As ICT use expands particularly in the developing world, an increasing percentage of the world's population is gaining access to knowledge resources (2) (Taylor et al., 2008, Beux and Fieschi, 2007). The number of cell-phone users in China already exceeds people in the US. Even Africa is experiencing rapid technological advancements, now considered the world's fastest

growing mobile telephone market, with a growth rate of 62.4% per annum (Taylor et al., 2008). The impact of HIV/AIDS on healthcare workers has been significant, with increased case burden, treatment of complex patients and long working hours. Further, poor pay, poor working conditions, isolation and lack of educational opportunity serve as contributing factors to the low appeal of healthcare work as a career (3)(WHO, 2006). For those already in the healthcare sector, out-migration accelerates in the presence of these conditions. The 2006 World Health Report revealed that non-physician providers such as nurses and midwives accounted for between 50-90% of all global healthcare provision. In light of the global nursing shortage, it is unsurprising that these health workers are easily lured away from developing nations; a trend likely to accelerate. So the question arises if ICT could be used as an adjunct to scale-up human resources in healthcare and (more importantly) to slow the outflow from developing nations. The potential avenues for success in this sector are multiple. The African Medical Research and Education Foundation (AMREF) has developed and implemented a program in Kenya with distance education as a key component to "train-up" 22,000 nurses within 5 years (4) (Taylor et al., 2008). Geneva University Hospitals have linked with a network for eHealth in Africa, to create a low cost distance educational network incorporating even the most remote central African rural areas of (Geissbuhler et al., 2007). The RAFT (Réseau en Afrique Francophone pour la Télémédecine) program is an example of global connectivity for Distributed e-learning. Despite infrastructure challenges and international bandwidth slower than DSL connections, RAFT, which initially started in Mali, now extends to 10 French-speaking African countries. RAFT successfully enables webcasting of video conferences even at 25 kbits/s; tele-consultations and the ability of physicians and health providers to practice outside of the usually earmarked educational centres. RAFT is an innovative program having successfully overcome barriers which usually inhibit delivery of educational materials through electronic methods in low income resource constraint settings(5) (Geissbuhler et al., 2007, Taylor et al., 2008, Bagayoko et al., 2006).

Telemedicine is the delivery of healthcare services at a distance using communication and information technologies. It involves secure transmission of medical data and information, in multiple formats including image and video for patient diagnosis and management (6,7) (Elder and Clarke, 2007, Saliba et al., 2012). Technological advances have allowed cross-border international delivery of health care(8) (Helble, 2011). For example, the ability to transmit high definition digital images across the world has enabled British hospitals to have access to specialist radiology services from Australian radiologists at night (Helble, 2011, Saliba et al., 2012). Despite this, the global telemedicine market is expected to grow from US$9.8 billion in 2010 to US$23 billion in 2015 (7)(Saliba et al., 2012).

2.1 Learning Management Systems

The so-called learning management systems (LMSs), offers a super ordinate structure to dedicated content. It provides organised and structured content to students (or interns), generally in a modular fashion and used for many different domains. Often LMSs also provide monitoring tools of material usage, online evaluation and testing, and a forum for communication between learners and teachers. Learning material is posted in a LMS and personalised classrooms can be generated by each user. LMSs of universities are focal points for providing learning material or computer-based examinations to learners(9) (Mildenberger et al., 2011). LMSs range from systems for managing educational records and training, to software for online or university course distribution using the Internet with inclusive features for online collaboration. Tertiary institutions use LMSs to both deliver and augment on-campus courses. Learning content management systems are a related technology focused on the development, management and publishing of the content to be delivered via an LMS

2.2 Moodle

Moodle is an open Course Management System and is commonly referred to as a Learning Management System. It has become very popular amongst lecturers and students alike. **Moodle** (abbreviation for Modular Object-Oriented Dynamic Learning Environment) is a free open-source e-learning software platform, also known as a Learning Course Management System or Virtual Learning Environment (VLE). Originally developed to help educators create online courses focusing on interaction and collaborative content construction, today it is a platform in continual evolution. The first version of Moodle was released in August 2002. As a license-free platform there is no limit to its

growth. Institutions can add as many Moodle servers as required. While the main focus of the Moodle project is to provide educators with the necessary tools to manage and promote e-learning, various methods to use the platform exist. Moodle is scalable from a few students in a single classroom to an audience of thousands. Moodle is also used in blended learning to augment face-to-face courses. Its interactive platform has chat facilities, databases, wikis and editable glossaries(10,11) (Wikipedia, Accessed 10 November 2012, Moodle, Accessed 10 November 2012).

2.3 Objectives of the Research

2.3.1 Primary Objectives

- To demonstrate that an appropriate infrastructure and method of working improves the outcome of Medical Students' studies at the University of KwaZulu-Natal and the MEPI Project
- Develop and maintain the LMS and Moodle programs to deliver the MEPI / ENTREE content, ensuring controlled access and secure content transmission.
- Integrate MEPI / ENTREE e-learning software with UKZN IT system and with local departments / partners.
- Ensure suitable software integration between UKZN and Columbia University.
- Develop suitable internet capacity at all clinical sites.

2.3.2 Secondary Objectives

- To enable MEPI / ENTREE to meet the needs of learners in the programme
- To support MEPI / ENTREE in the strategic planning, and process development that is necessary to underpin their developm
- ent and embedding of e-learning.
- To promote learning research, innovation and development that begin with a focus on student learning rather than on developments in technology per se, enabling students to learn through and be supported by technology.

2.4 Results

The results of the MEPI programme and its innovation for video conferencing have exceeded its expected outcomes. This is evident in the fact that primary objective listed above was to provide de-centralised teaching but it has provided the university with a resource that has benefited other departments. Through this innovation patients are being diagnosed remotely and this happens at least once per week through video conferencing to multiple sites.

We have learnt that if we think out of the box it is possible to innovate and conduct teaching even in the poorest of areas. These innovations can sometimes yield results that can benefit a wider population such as the example above.

This was achieved by:

- Use of microwave technology to replace conventional methods of connecting.
- Multi point conference unit which can connect to multiple platforms example Windows, Mac/Ipad OS, and android devices .
- Recording lectures for those who miss them.
- The use of mobile technology such as cell phones and tablet PC's to view teaching were also unexpected outcomes that the project delivered.
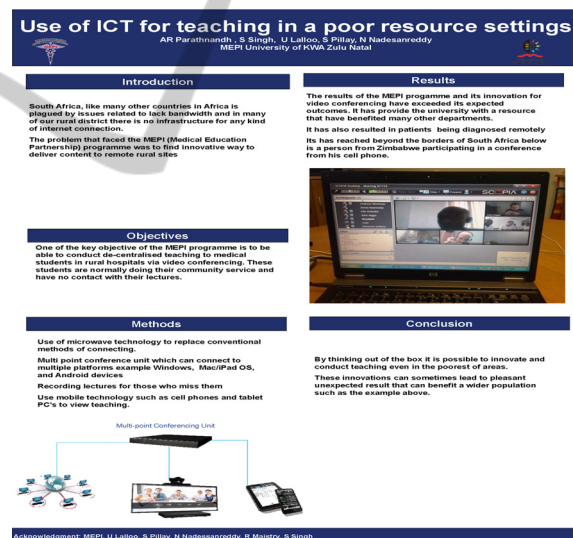

Figure 1.

3 CONCLUSIONS

We have learnt that if we think creatively it is possible to innovate and conduct de-centralised teaching even in the poorest of areas. These innovations can sometimes yield results that can benefit a wider population such as the examples above.

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