Implementation of E-learning in Nursing Education in Malawi: The case of Kamuzu College of Nursing – University of Malawi

Abstract
Kamuzu College of Nursing (KCN) is a constituent college of the University of Malawi has two campuses in Lilongwe and Blantyre, separated by a distance of about 300 kilometers; KCN is the largest national producer of professionals in nursing and midwifery. KCN adopted an E-learning platform due to pressure to increase intake of nurses in order to meet the demand of the Malawi health. In response to the demand for nurses and midwives, KCN has resorted to increasing student in-take and in diversifying its post - graduate programmes including MSc Programmes and starting a PhD programme. This paper describes how implementation of blended learning using e learning to complement face-to-face teaching is able to improve teaching and learning of nurses in Malawi.

An e-learning project has supported a blended learning approach to delivering undergraduate, postgraduate and CPD education in KCN through the introduction of e learning between 2006 and 2016. Through the project, a Student Management System and Curriculum Management System were established and were complemented by the initiation of capacity building through workshops on digital content creation, development of e-resources, ICT infrastructure improvements, making CMS and resources accessible to staff and improving internet connectivity.

Results under the project include the local development of resources and KCN have developed in excess of 100 digital resources. ICT infrastructure improvements have done include the procurement of new high-spec servers, desktop PCs, resource repository, and CMS. CMS and resources are accessible to staff and students through the CMS via the intranet (internal network) which is fast, reliable and robust. In total, over 50 faculty members have been trained. Long-term sustainability is assured as facilitation of workshops, is done by local Malawi's faculty members; provision of existing digital resources from the University of Edinburgh with over 400 resources provided and include interactive computer-based tutorials, videos, quizzes, virtual patients etc. These are available from a local repository and made accessible to students and staff via a locally developed Curriculum Management System (CMS). There has also been staff development in new pedagogies, e-assessment (standard setting, writing good MCQs, writing effective feedback, assessing clinical skills, using e-learning and CMS most effectively.

The process of establishing e learning in nursing education can be very challenging. Using e-learning platforms requires investments in lectures education in ICT, availability of ICT resources like computers, and student's accessibility to IT use. Distance learning, creating full-fledged nursing education programmes, and linking the two campuses with clinical sites for clinical teaching using e-learning platform are the future plans for e-learning education in Malawi.

Introduction
Malawi is experiencing critical shortage of nurses. However, KCN has doubled the student intake for registered nurses over the past five years. The increase has come with some challenges including the need for additional Lecturer rooms, more Library space, increased accommodation, increased work-load for faculty; and increase in operational costs, increased demand for teaching and learning materials. These challenges, requires innovative teaching methods and solutions in delivering the curriculum. KCN is now putting in place e-learning infrastructure to solve these problems, where two systems are being implemented, the Student Management system and the curriculum management system

Background

Kamuzu College of Nursing (KCN) is a constituent college of the University of Malawi (UNIMA). The college has two campuses in Lilongwe and Blantyre, separated by a distance of about 300 kilometers, and major clinical sites in Blantyre, Lilongwe, Zomba and Mzuzu. Traced back from 1965 when it was called a National School of Nursing, and then upgraded to a full constituent college in 1979, the college has been offering a variety of courses in the fields of Nursing and Midwifery.

The National Human Resources for Health (HRH) Census (2008) and World Bank (2013) put the number of Nurses at 4,000 representing 13% of the total health workforce. This population of nurses translates to about 1 nurse per 3,000 people in Malawi, thus a nurse to patient ratio of 1:3000, which is higher than the WHO recommended ration of 1:1000 for developing countries. To increase the number of nurses being trained in Malawi, support from the Emergency Human Resources Plan increased graduating nurses to about 600 nurses annually with 100 being registered nurses. However, the population of registered nurse midwives with B.Sc. degree is still low. The challenge for Malawi is therefore to train and double the number of registered nurse midwives at degree level. Currently less than 25% of all nurses in the health system were trained at degree level.

KCN is one and largest national trainer of B.Sc. professionals in nursing and midwifery. The college offers a wide choice of programs at Diploma, B.Sc., M.Sc., and PhD levels. The graduates are employed by Government (Ministry of Health), private and mission hospitals, as well as training institutions. Almost all nursing and midwifery instructors in CHAM private colleges are KCN graduates. The college has a major responsibility and role to play in ensuring quality nursing and midwifery services in Malawi. The Vision of KCN is *"To be an academic institution providing relevant world-class nursing education, research and services for sustainable development of Malawi and the world"* while the college's mission is 'to deliver high quality education and cost-effective nursing and midwifery education and other health related programs to students and other stakeholders through teaching, research, consultancy and outreach; to advance professional growth and promote the health of the people of Malawi and beyond'.

Main challenges facing teaching and learning at KCN

Clinical learning is the core of nursing and midwifery education. Previously, students were being placed in four central hospitals for clinical learning. With the large student numbers, the students require that they be placed in district hospitals for clinical learning. Currently KCN students are placed in most district hospitals in the currently. Unfortunately, there is very limited interaction with their lecturers during clinical placements. The college is being forced to recruit and Lecturers are ever on the road, traveling to undertake clinical supervision. This strains the college resources and Lecturers ability to provide quality education to students.

KCN has a new campus in Blantyre, which accommodates about 500 students but lacks a nearby teaching hospital for students' clinical placements as well as a Library. This is at a site where a new hospital is to be constructed. Currently, KCN continues to use Queen Elizabeth Central Hospital and district hospitals in the Southern Region for students at the new campus, providing challenges with transport, supervision and access to Library resources.

The college has a 60-bedded hostel at the new campus in Blantyre and 260 bedded new hostel in Lilongwe. The nature of nursing and midwifery training requires that students should be on night duty at various times during the training. Sometimes they knock off late from the clinical area depending on the patient/client demands. Hence, the need for students to be accommodated within the college premises. The plan is to have an extra 240-bedded hostel in Blantyre and a 360-bedded hostel in Lilongwe, but funding is yet to be sourced. Currently,

some nursing students are being accommodated in private apartments within the two cities of Blantyre and Lilongwe creating challenges

One of the major challenges affecting KCN campuses is limited bandwidth for research and Internet access. The college can currently afford 1MBPS for bandwidth which is very little and sometimes very frustrating for academic staff to conduct research.

Classroom teaching of large numbers is easier than clinical teaching where more intense one to one supervision is required. There is need for more clinical instructors to be recruited; however, the college budget is already overstretched. At least an additional 10 clinical instructors are required across the departments. Government should adequately equip the hospitals

Lilongwe Campus has a library that can hold 250 students and Blantyre campus library can hold 50 students. The new Blantyre campus has no library because funds for construction of the new campus were inadequate to include a Library. There is need for extension of the library in Lilongwe into a 400 sitting capacity library and there is also a need for construction of a 300 sitting capacity library in Blantyre.

KCN Lilongwe campus has one Nursing Skills laboratory with a capacity of 30 and the current Blantyre campus has a laboratory that can hold 15 people. Maternal Child and Health (MCH) department has a skills laboratory with capacity of 6 beds. The new Blantyre campus does not have a Nursing Skills laboratory because construction funds were inadequate. KCN requires a nursing skills laboratory for teaching students to acquire various competences. A critical measure of the quality of nursing and midwifery education is the ability to produce competent graduates that will provide safe care to individuals, families, and communities. Currently, the college has introduced an innovative clinical teaching approach where students are placed in the skills laboratory as part of their clinical placement. This will facilitate students' acquisition of various competences as they can have repeated demonstrations using manikins. Such opportunities are not feasible in the clinical setting with real patients. The college has also integrated Objective Structured Clinical Examination (OSCE) as part of clinical assessment. These innovations require availability of a well-equipped and spacious Nursing Skills laboratory. The available Nursing Skills laboratory space is not adequate and not well equipped especially with the large number of students.

Lilongwe campus has 2 lecture theatres that can handle 440 students. Blantyre Campus has one lecturer hall that can handle 200 students. There is need for 4 more lecture theatres (2 at each campus) to adequately accommodate all students.

The E-learning project in Malawi

University of Edinburgh has supported the rolling of e learning in three colleges in Malawi since 2006. The college of Medicine which trains medical doctors, the Malawi College of Health Sciences which training clinical officers, laboratory technicians, dental technicians, nurse technicians and environmental health officers; and the KCN which trains registered nurses. The overarching aim of the project was to support the transformation of medical and clinical education in Malawi through the introduction of e learning. The focus of the project was on using e learning to support as part of a blended learning approach to delivering undergraduate, postgraduate and CPD education rather than distance education. Since 2006 we have worked with medical and healthcare educators in all three colleges across a number of areas including capacity building through in-country training of trainers workshops on digital content creation facilitated by Edinburgh staff, providing existing digital resources from the University of Edinburgh including interactive computer-based tutorials, videos, quizzes, virtual patients etc. These are available from a local repository and made accessible to students and staff via a locally-developed Curriculum Management System (CMS), Local

development of resources and ICT infrastructure improvements in new high-spec servers, desktop PCs, resource repository, CMS etc. CMS and resources are accessible to staff and students through the CMS via the intranet (internal network) which is fast, reliable and robust. Internet connectivity is not sufficiently reliable at this time and curriculum development - particularly with CoM who have set about completely rewriting their medical degree course significantly reducing staff contact time and introducing new curricula areas; Staff development in new pedagogies (e.g. PBL), e-assessment (standard setting, writing good MCQs, writing effective feedback, assessing clinical skills), using e-learning and CMS most effectively, recording CPD activity (designed and built an online system for doctors at CoM to record CPD online) with the system being adopted by the Malawian Ministry of Health and rolled out to doctors working across Malawi and may in the future be adapted and adopted for nurses and clinical officers.

The E-learning project at KCN

E-learning services have evolved since computers were first used in education. There is a trend to move toward blended learning services, where computer-based activities are integrated with practical or classroom-based situations. KCN has been involved in the e-learning project to support a blended learning approach to delivering undergraduate, postgraduate and CPD education through the introduction of e learning between 2009 and 2016. The project involved the establishment of a Student Management System (SMS) and Curriculum Management System (CMS); initiated capacity building through workshops on digital content creation, and development of e-resources, ICT infrastructure improvements, making CMS and resources accessible to staff and improving internet connectivity

In KCN, the KCN E-learning committee facilitated the project locally. The committee developed a comprehensive proposal that outlined the E-learning program for implementation in the next 5 – years. The committee comprised Lecturers from the two campuses; Blantyre and Lilongwe: The committee agreed on one major recommendation, which was to develop a full proposal that was to guide E-learning at KCN. The proposal highlighted the following:
- Type of E-Learning to be adopted
- Requirements for implementation including computer infrastructure, internet connectivity between Blantyre and Lilongwe campus and well as within the two campuses, servers types and sizes, capacity building requirements for Faculty members and students, network and system support.
- Implementation plan for E-learning program including phases, processes and timelines
- Budget proposal for different processes, and activities
- Implementation support requirements – different stakeholders to be involved in support of implementantion
- Equipment suppliers
- Partner University / College with previous experience in E-learning development and use
- Training plan, site and methodology of faculty and students on how to use E-learning

Reasons why KCN adopted E-Learning
KCN has been facing challenges in its efforts to increase intake to address the serious shortage of Nurses in Malawi and assist Lecturers. KCN adopted an E-learning platform due to pressure to increase intake of nurses in order to meet the demand of the Malawi health system. It was envisaged that E-Learning could provide four major benefits for the KCN and students involved.

1. **Access to quality education:** KCN faculty and instructors of the highest calibre from other universities can share their knowledge across borders can allow students to attend courses across physical, political, and social boundaries. Recognized experts have the opportunity of distributing information internationally at minimum costs.
2. **Affordable education:** E-learning can drastically reduce the costs of higher education, making it much more affordable and accessible to the masses. An internet connection, a computer, and a projector would allow an entire classroom in KCN to benefit from the knowledge of a distant instructor. This means we can use experienced instructors from other universities to assist in teaching our students as well as get other lecturers who we don't have within our college to teach our students.
3. **Convenience and flexibility to learners:** in many contexts, eLearning is self-paced and the learning sessions are available 24x7. Learners are not bound to a specific day/time to physically attend classes. They can also pause learning sessions at their convenience.
4. **Reducing environmental impact:** eLearning allows people to avoid travel, thus reducing travel time, expenses and inconveniences. The fact that it takes place in a virtual environment also allows some reduction of paper usage. With virtual notes instead of paper notes and online assessments instead of paper assessments, eLearning is a more environmentally friendly solution.

KCN situation before embarking on expansion and adoption of e learning
- Pressure to increase intake which was at 100 for generic B SC program, 30 for Post Basic BSc programme, 30 University Certificate in Midwifery, 20 Diploma in Nursing and 16 MSc in Midwifery and Reproductive Health, which are all very low to meet the demand of the Malawi health system.
- In-adequate numbers of faculty teaching staff.
- High mobility of faculty members and students between campuses and teaching sites including district hospitals in Malawi

Strategies put forward to address the situation
- Provide an inter-connectivity of the two teaching campuses and two major clinical teaching areas.
- Training of faculty in ICT and development of e-learning tools and content
- Development of KCN curriculum and course content to be delivered using ICT tools and equipment
- Development of an internet and intranet systems to enable KCN curriculum and course content delivery using ICT tools and equipment
- Introducing systems for students to access teaching and learning materials, assignments and examinations using ICT tools and equipment
- Introducing post basic training programs decentralized through the two teaching campuses and two major clinical teaching areas while students continue working in their places of work

Resources that supported the e learning project
The e learning project was possible among other factor because of the following;
- Malawi Telecommunication Limited (MTL), a telecommunications company in Malawi had embarked on establishing a backbone Fiber connection that is currently running across Malawi and connects to Mozambique and Tanzania.
- KCN Blantyre campus benefited on an initiative made by research and education institutions in which MAREN took a lead by installing Fiber connection between College of Medicine, KCN Blantyre campus, Malaria Alert Centre, Malawi Liverpool Welcome Trust (MLW), and the Queen Elizabeth Central Hospital (QECH) and other institutions around that area which enables them to have fast internet connectivity. Since this is a shared contribution, it also enabled them to share resources such as;

networking, antivirus, research, journals and many more within their huge network.

- This initiative came as a result of the common problems that these institutions were facing on Internet connectivity. Each of these organizations has previously subscribed to different Internet service providers, which has been very, slow, expensive, and not very reliable. The college currently has a campus network installed in 2005, which it hopes to integrate with the proposed network. Equally, the college has technical staff in ICT and administration that will be assigned to the project.
- Faculty members are very committed to delivering their courses online as there is duplication of effort under the current setup. They pledged all their full support to the
- The ICT team came together and customized a Moodle framework to arrive at the ideal curriculum management system that covers all aspects the lecturers highlighted., where lectures can upload their modules, electronic resources, quizzes, discuss forums, video simulations etc. . The resources are linked systematically according to the module structure.

KCN Expansion
Professional nursing training in Malawi dates back to 1965 with the introduction of a National School of Nursing Commissioned to train Registered Nurses and Midwives. Prior to 1965, the few registered nurses and midwives practicing in Malawi trained in various parts of the world including Germany, United Kingdom, Israel and Zimbabwe.

The National School of Nursing was based in Blantyre and was a Ministry of Health training institution that graduated small numbers between 15 and 20 nurses and midwives each year. Graduates from these programs received a General Certificate in Nursing and a Certificate in Midwifery.

After 14 years of its existence, the nursing and midwifery programs were upgraded to a diploma in nursing program and a University Certificate in Midwifery. Both programs were offered by the University of Malawi starting from October, 1979.

In 1991 new developments emerged to upgrade the University Diploma program into a Degree program. A baccalaureate (generic degree) program was developed that replaced the diploma program. The Generic program started in 1993 and continues to run to date.

Kamuzu College of Nursing is currently two faculties; the faculty of nursing and the newly approved faculty of Ante-nantal, maternal and Child Health Services. It has four teaching departments and offers nine undergraduates, Six Masters and One PhD programs. The college has staff complement of 190 that are working in various departments such as academic, administrative, and clerical and technical staff (CTS). A total of 80 are academic staff.

The college has been increasing the student numbers every year. Over a three - year period, the total enrolment increased from 520 in 2011/12 to 758 in 2012/13 and to 875 during the (2013-2014) year, representing an increment of 68.3% over the three-year period. During the (2013-2014), there were 761 undergraduate students pursuing B.Sc. generic program in nursing and midwifery, 29 students pursing the University certificate in midwifery program, 35 students pursing B.Sc. (Post basic) programs, 50 M.Sc. students and 7 PhD students. In 2014 – 2015 academic year, 235 students joined year one making the total for the B Sc. Generic program 996.

The college has also developed a PhD Program in Inter-professional Health Care Leadership. The program, which was rolled out in 2013/14 academic year, was launched on 27th June, 2014 and has enrolled 7 students. The development of the PhD program was sponsored by NEPI through ICAP and is a direct result of the designation of KCN as a WHO collaborative Center for Health Inter-professional Leadership Training and Collaborative Practice.

The development of human resources at KCN over the past three years is shown in the table below. During the 2013 / 2014 year, there were 46 Lecturers, 10 Senior Lectures, 7 Associate Professors and 3 Professors at the college.

Staff categories at KCN during the 2013 / 14 Academic year

Year	Lectures	Senior Lecturers	Associate Professors	Professors
2011/12	35	7	0	1
2012/13	40	10	3	1
2013/14	43	10	7	3
2014/15	48	10	7	3

ICT infrastructure improvements at KCN
Over the period of implementation of the e learning project, KCN has established an ICT network, which provides Internet connectivity in each and every classroom and office at both campuses in Lilongwe and Blantyre. There is also a fibre link between the two campuses. Lilongwe campus is linked with MTL using optic fibre backbone cable to the Internet while Blantyre campus is linked with college of Medicine using fibre cable as well. The college has also introduced internal network (intranet) and deployed several intranet services for both faculty and students.

KCN has an Internet domain and each member of staff and student has a username and password which they us to login into any computer and has a personal folder and shared folders in which they access their files on any computer (Virtual profile).
The college implemented the use of email calendar online where meeting invitations are set using Google apps, Google calendar. The email calendars give reminders to invited parties. Printed memos are slowly being replaced by this technology, hence reduction in stationary expenses.

At both campuses there is an intranet website. The site links all web-based resources like internal electronic directory, news and events are also posted there, hence there is no need for printing circulars. Student Management systems are fully implemented where students check exam results, lecturers also use the site to upload notes and assignments for students.

KCN is one of the colleges that have fully implemented the Library system with the pioneering of the college librarian; the system uses barcode to borrow books hence the use of pockets was phased out. E-learning resources are used on campus. These resources were developed by KCN lectures with video illustrations and simulations of clinical cases. There are more than 500 different medical resources (E-learning resources), which are used by students. In addition, the college has developed a website which include staff portal for staff visibility. The webpage is available at; www.kcn.unima.mw

Kamuzu College of Nursing has successfully integrated student academic record information system with the new finance application ACCPAC. The integration is assisting to track students' academic and financial status and has assisted to enforce the current UNIMA policy of no fees no registration.

The college has deployed videoconference and Tele-class technologies using an open source package and MTL fibre connection. This technology is used to communicate between Blantyre and Lilongwe campuses. PowerPoint presentation is shared and real time discussions are held on real-time. Lecturers in one campus also use the technology to teach students at

another campus. At Lilongwe campus a **Wi-Fi** network connection has been set up to provide wireless Internet connection across the entire campus.

KCN is conducting continuous professional development workshop after every 3 months. The lecturers are taught how to use different tools to create e-resources such as engage processes, quizzes, surveys and flash animations. They are also taught how to create videos, storyboards, edit videos and voice over and how to link resources to CMS in the appropriate module topic.

The video equipment is used to communicate between KCN Lilongwe campus, College of Medicine and KCN Blantyre campus. There are clients at each site and high Definition or low Definition Meetings are held depending upon the quality of the network on a particular day.

The Student Management System and the Curriculum Management System
Apart from lecturers delivering content to students administration also had a requirement to manage the students from the administration part. Student management system was created in house to assist in registration of students, financial recording, examination grades records, transcript generation, student accommodation management, and keeping student records

The curriculum management system handles the academic and learning resources including situations where lecturers upload their modules, electronic resources, quizzes, discuss forums, video simulations by The development of these modules is an interactive process between lecturers, the ICT department and College Administration

Conclusion
The process of establishing e learning in nursing education in Malawi through KCN has been very challenging. The e learning project illustrates the complexities of the opportunities provided through innovations like e learning to address myriad of challenges like shortage of health workers including nurses in developing countries like Malawi. Using e-learning platforms requires making sure those investments in lectures education in IT, availability of IT resources like computers, student's accessibility to IT use. Secondly, it requires going beyond IT provision, and training but also mentality change, dedication and commitment. And thirdly, it requires active participation from multiple sectors and individual to have an effectual impact. Distance learning, creating full-fledged nursing education programmes, and linking the two campuses with clinical sites for clinical teaching using e-learning platform are the future plans for e-learning education in Malawi,

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