

**UNIVERSITY OF KWAZULU NATAL**

**AN ANALYSIS OF THE UTILISATION OF E-LEARNING  
PLATFORM AT A SELECTED NURSING SCHOOL IN RWANDA:  
A PARTICIPATORY ACTION RESEARCH STUDY**

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**AN ANALYSIS OF THE UTILISATION OF E-LEARNING PLATFORM AT  
A SELECTED NURSING SCHOOL IN RWANDA: A PARTICIPATORY  
ACTION RESEARCH STUDY**

A Thesis submitted to the School of Nursing and Public Health, College of Health Sciences,  
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Philosophy (Nursing)

By

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## DECLARATION

I, Alexis HARERIMANA declare that this thesis entitled “*AN ANALYSIS OF THE UTILISATION OF E-LEARNING PLATFORM AT A SELECTED NURSING SCHOOL IN RWANDA: A PARTICIPATORY ACTION RESEARCH STUDY*” conducted under the supervision of Professor MTSHALI is my original work. All resources have been acknowledged by means of referencing.



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20<sup>th</sup> February 2017

**DATE**



**N.G MTSHALI**

20<sup>th</sup> February 2017

**DATE**

## **DEDICATION**

This thesis is dedicated to all Nurse Educators, and Nursing Students who are embracing the use of technology in education with the aim of improving the quality of care delivered to the Rwandan Population. It is also dedicated to everyone who contributed to making the dream of having e-learning in the education of nurses/ midwives come true in Rwanda, and who are striving to make it more sustainable.

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## ABSTRACT

**Background:** E-learning is a commonplace in nursing and healthcare professional education, and generally the importance of Information and Communication Technology (ICT) and the internet in tertiary education is recognised. The use of technology is a policy directive in Rwanda.

**Aim of the study:** The aim of this study was two-fold, that is to: (i) Collaboratively analyse the utilisation of the e-learning platform in selected nursing school campuses at University of Rwanda (UR), in Rwanda; (ii) Develop a middle-range theory on the implementation of e-learning in selected nursing school campuses at UR, in Rwanda.

**Methods:** Participatory Action Research, and convergence parallel mixed methods (quantitative and qualitative data) also known as concurrent triangulation design were used, where quantitative and qualitative data were collected simultaneously as recommended by Creswell and Clark (2007). Quantitative data was analysed using SPSS 23, and for qualitative data, the framework of grounded theory by Strauss and Corbin guided the analysis. Triangulation of results was done in chapter six of discussion of the results.

**Results:** The quantitative findings of this study indicated that in e-learning, a blended mode was used and included 40% of face-to-face, and 60% of online teaching. ICT was reported to be pivotal in teaching and learning. Of 44 nurse educators, 95.5% reported using ICT applications to prepare presentations for lessons; 95.5% reported using ICT to provide feedback and/or assess students' learning. Of 227 students, 96.9% used the internet to access full web-placed courses, and 93% for communication with their lecturers.

Qualitative findings reflected E-learning as the core phenomenon of the investigation. E-learning was conceptualised as a mechanism to advance a political agenda, as a student-centred approach, as blended learning, and as a tool to open access to education for working nurses and midwives. The context of e-learning in nursing education is subjected to both internal and external influences in which education, health and technology originate. Data from this study indicated a number of intervening conditions which influenced the process of developing the middle range theory. There are two major processes involved in this model: Catalyst agents and hybrid teaching and learning. The catalyst agent process focuses on institutional support for students and teachers. The process of hybrid teaching and learning represents the actual facilitation of teaching and learning, through two phases: course development, and course delivery. The outcome of this is to improve the

quality of nursing education, to fast-track production of the nursing workforce, to enhance nursing care and services, to enhance collaborative partnership, and to promote lifelong learning.

**Conclusion:** E-learning is inspiring many in nursing education, and its success depends on adequate technology-based tools and guidelines that can be used in the establishment of a supported network learning space by using technology in teaching and learning.

**Keywords:** blended learning, web-based learning, e-learning, distance learning, ICT in education.

## **LIST OF ABBREVIATIONS**

<b>CMHS:</b>	College of Medicine and Health Science
<b>DDLm:</b>	Demand Driven Learning Model
<b>EAC:</b>	East Africa Community
<b>E-MAIL:</b>	Electronic Mail
<b>FAO:</b>	Food and Agriculture Organisation
<b>FTP:</b>	File Transfer Protocol
<b>HRH:</b>	Human Resource for Health
<b>HTML:</b>	Hypertext Mark-up Language
<b>HTTP:</b>	Hypertext Transfer Protocol
<b>ICT:</b>	Information Communication Technology
<b>IP:</b>	Internet Protocol
<b>IT:</b>	Information Technology
<b>LAN:</b>	Local Area Networks
<b>LMS:</b>	Learning Management System
<b>MoH:</b>	Ministry of Health
<b>NCNM:</b>	National Council for Nurses and Midwives
<b>PAR:</b>	Participatory Action Research
<b>SPSS:</b>	Statistical Program for Social Science
<b>UNESCO:</b>	United Nations Educational, Scientific, and Cultural Organisation
<b>UR:</b>	University of Rwanda

**WHO:** World Health Organisation

**WWW:** World Wide Web

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# **CHAPTER 1**

## **INTRODUCTION AND BACKGROUND TO THE STUDY**

### **1.1 INTRODUCTION**

The use of technology, and in particular of e-learning, in higher education is becoming progressively more used (Button, Harrington and Belan, 2014; Njenga and Fourie, 2010; Applebee, McShane, Sheely and Ellis, 2005). E-learning is commonplace in nursing and healthcare professional education (Koch, 2014), and generally the importance of Information, Communication Technology (ICT) and the internet in higher education is well documented (Kheswa, 2010; Nwezeh, 2010; Kumar and Kaur, 2005). As a result, in nursing education both teachers (Button et al., 2014; Nguyen, Zierler and Nguyen, 2011; Mancuso, 2009), and students (Jetté, Tribble, Gagnon and Mathieu, 2010; Elder and Koehn, 2009; Timmins and Dunne, 2009) are anticipated to integrate digital technologies, in order to help undergraduate nursing students in their learning. An e-learning platform is an environment integrating tools and services (Ardito, De Marsico, Lanzilotti, Levialdi, Roselli, Rossano et al., 2004). E-learning uses information, communication, and technology to learn (Nagarajan and Jiji, 2010; Ardito et al., 2004). Learning in a virtual environment involves computer-mediated learning, web-based learning, virtual teaching and learning and digital collaboration (Rennie and Morrison, 2013; Nagarajan and Jiji, 2010; Singh, 2003; Horton and Horton, 2003). It is used by teaching and learning establishments to improve and support teaching while offering courses to a greater number of students around the world. Students can learn on they own, and may be facilitated by the teachers. This is usually done using the media such as audio, images, videos, and text (Nagarajan and Jiji, 2010).

There are issues, however surrounding ICT literacy, and e-learning facilitation which impact negatively on the progress of students and health care professionals in general (Button et al., 2014; Capdeferro and Romero, 2012; Tohm, 2012; Turker, Görgün and Conlan, 2006; Barnard, Nash and O'Brien, 2005; Childs, Blenkinsopp, Hall and Walton, 2005). Although the importance of e-learning is well-known, e-learning is not indisputable and many times raises challenges (Childs et al., 2005). According to Alkharang and Ghinea (2013), there is a great need to solve the issues related to the expansion of ICT, and its ability to offer access to a

variety of knowledge (Alkharang and Ghinea, 2013). Rhema and Miliszewska (2010) and Kundi, Nawaz and Khan (2010) state that in many third world countries, use of ICT and putting into practice e-learning are still in an early stage. However, the literature reveals that face-to-face learning model is no more the single educational model, due to the arrival of e-learning that allows access to education, irrespective space and time (Lee, Yoon and Lee, 2009; Hyeoncheol and Injin, 2007).

The success of e-learning in general is determined by a teaching model which responds to the students' needs and educational goals and which requires a multidisciplinary approach (Ramírez-Correa, Rondan-Cataluña, Arenas-Gaitán and Alfaro-Perez, 2017; Lee et al., 2009). Similarly, Kundi, Nawaz and Khan (2010). In order to achieve this, nursing education requires the adoption of facilitation methods based on identified methods (Lekalakala-Mokgele and du Randt, 2005). E-learning is certainly the utmost important transformation to take place in nursing education ever since the move from hospital training to the higher education sector (Button et al., 2014). The ability to use ICT by both learners and teachers, has an impact to the integration e-learning into the existing teaching programs (Button et al., 2014).

The purpose of this study is therefore to explore the current situation in using an e-learning system in selected nursing school and to develop a middle-range theory that may guide the utilisation of an e-learning platform in nursing education. Participatory action research was used. The following aspects are discussed in this chapter: background to the study, research context, problem statement, research objectives, research questions, significance of the study, operational definitions and conceptual framework.

## **1.2 BACKGROUND TO THE STUDY**

With the growth of Information, communication and technology, e-learning is pervasive in many countries around the globe (Bichsel, 2015; Zhou and Xie, 2010). In recent years, pressure has come from legislators and other interested parties to integrated e-learning technologies in conventional tertiary education (Altarawneh, 2011). Technological innovation is rapidly transforming the ways that institutions of higher education teach and students learn (Economist Intelligence Unit, 2008; James and Hopkinson, 2008). Many universities around the world have initiated gigantic projects to make ICT into a robust teaching tool (Zhou and Xie, 2010; Higher Education Academy, 2009; O'Neill, Singh and O'Donoghue, 2004).

According to Donnellan (2010), the integration of ICT in UK schools have revealed that its use in education has numerous learning advantages. The Economist Intelligence Unit (EIU) (2008), reported that the impact of ICT is significant in tertiary education. It was found in a survey conducted by the EIU (2008) that the majority of the participants from both the public and private sectors reported that technological revolution is influencing educational practices. In fact, ICT was a core differentiator in appealing students and stakeholders. In developing countries and in particularly Africa, teaching institutions have made efforts to integrate ICT into the education sector to facilitate e-learning. This is in acknowledgement of the crucial impact that e-learning in tertiary education, and the communities in general (Addah, Kpebu and Frimpong-Kwapong, n.d; Bristol and Alcindor, 2014; Rupp, 2012; Isaacs and Hollow, 2012).

The use of information communication technology and social networking has grown rapidly in recent years and these technologies are progressively being integrated into tertiary education (Garrison, 2011; Garrison and Anderson, 2003; Laurillard, 2002). As a result, both nurse educators (Nguyen et al., 2011; Mancuso, 2009; Bristol, 2005) and preregistration nursing students (Jetté et al., 2010; Elder and Koehn, 2009; Timmins and Dunne, 2009) are being expected to incorporate and use digital technologies to support teaching and learning in nursing curricula. The use of such technologies in teaching and learning is known as e-learning (Garrison, 2011; Goodfellow and Lea, 2007; Laurillard, 2002).

In nursing education, several studies have shown that e-learning has numerous positive aspects. The flexibility provided by the online learning environment and the ability for self-directed learning is important (Hallila, Al Zubaidi, Al Ghamdi and Alexander, 2014; Farrell, Isaacs, Trucano, Hamdy, Hare, Tetang Tchinda et al., 2007a). Studies demonstrated that students appreciated the online learning environment as it facilitates students to familiarise with one another outside of the school settings (Smith, Passmore and Faught, 2009; Kelly, Lyng, McGrath and Cannon, 2009; Maag, 2006). Nursing students felt that learning in the online environment was deeper learning than in the classroom (Mitchell, Ryan, Carson and McCann, 2007). It was further argued by Balakrishnan (2010) that e-learning provides communication without boundaries (global education). Furthermore, Bouhnik and Marcus (2006) point out that e-learning facilitates the ability to choose when to attend a lesson, irrespective of the time and the location. It allows self-directed learning, accessibility of internet resources, and the possibility to collaborate with colleagues without limitation. It is argued that new educational

approaches and e-learning provides opportunities for facilitators and students to share innovations on their works with the immediate support (Carper, 2001 cited in Liaw, 2008). Dee and Stanley (2005) argued that nursing professionals need a wide variety of health information to meet their clinical and educational needs (Shakarishvili, Atun, Berman, Hsiao and Burgess, 2009).

In nursing, computer and network literacy have a significant impact on e-learning. It was found from the literature that ICT and the internet were underutilised among healthcare professionals for database searching as a source of information (McGowan, Grad, Pluye, Hannes, Deane, Labrecque et al., 2010; Bouhnik and Marcus, 2006; Dutton and Perry, 2002). Several factors hindered nurses' successful information searching, including lack of access to a computer (de Veer, Fleuren, Bekkema and Francke, 2011; Kalyanpur and Kirmani, 2005; Richwine and McGowan, 2001) and lack of time to search massive volumes of health literature (Kelly, Martin, Kuhn, Cowan, Brayne and Lafortune, 2016; Dee et al., 2005; Verhey, 1999). It is argued that a number of nurses are hesitant to use digital information resources, and this is related insufficient computer literacy (Dee et al., 2005; Mccaughan, Thompson, Cullum, Sheldon and Thompson, 2002; Bachman and Panzarine, 1998).

### **1.3 RESEARCH CONTEXT**

Rwanda is a country of a thousand hills, located in sub-Saharan Central Africa in the Great Lakes region (Mukamana, 2013). The population for 2014 is estimated at 12.2 million, and increased from 11.8 million in 2013 (The World Bank, 2013). The capital of Rwanda is Kigali. Despite the period of civil war and the 1994 genocide against the Tutsis, Rwanda's economy is growing steadily due to community-driven initiatives that are responding to the needs of the population (Kloppper and Uys, 2012). Statistics for 2011 reported approximately 700 physicians, 8000 nurses, and 300 midwives providing care for over 11 million people (Rwanda Ministry of Health, 2011). Rwanda is at the lowest level of the World Health Organisation's recommended healthcare providers per 1,000 people (Thuss, 2014). The Ministry of Health is in charge of the healthcare system in Rwanda and is committed to providing and improving quality health resources for the population (Kloppper and Uys, 2012).

### **1.3.1 ICT and education in Rwanda**

Information communication technology is fundamental to Rwanda's Vision for 2020 (Republic of Rwanda, 2012b; Rubagiza, Were and Sutherland, 2011; Hennessy, Onguko, Harrison, Ang'ondi, Namalefe, Naseem et al., 2010; Farrell, 2007), and has been adopted in the Rwandan education system (Farrell, 2007). According to the statistical information on higher learning institutions in Rwanda and their research contribution (Sindayigaya, 2010), the field of technology was 3% between 2009 and 2010. This is an indicator that effort must be put in the field of technology and that researchers must be encouraged to contribute much more (Sindayigaya, 2010). The same author states that the main contribution is in the domain of education and social sciences with 38%, followed by arts and humanities with 34%, and sciences with 25% (Sindayigaya, 2010).

### **1.3.2 Nursing workforce and nursing education in Rwanda**

#### **1.3.2.1 Nursing workforce in Rwanda**

The nursing workforce in Rwanda consists mainly of three categories of nurses and midwives: those with a Bachelor's degree (A0), those with an advanced diploma (A1), and those with a diploma (A2) (Anatole, Magge, Redditt, Karamaga, Niyonzima, Drobac et al., 2013). Very few have completed Master's or PhD degrees. According to the National Council for Nurses and Midwives (NCNM), A1 or registered nurses and midwives have at least an associate degree or its equivalent, with a license to practice without any supervision from another nurse. The A1 level is obtained on completion of three years training post-secondary school. A2 or associate nurses and midwives hold an advanced general certificate of secondary education or its equivalent; they work under the supervision of a registered nurse (Republic of Rwanda, 2008a).

The critical shortage of health professionals has resulted in only 30% of health facilities being able to meet minimum staffing needs (Africa Health Workforce Observatory (AHWO), 2009). A significant factor contributing to the shortage of professional nurses is the insufficient number of qualified nursing faculty (Thuss, 2014; Rukholm, Stamler, Talbot, Bednash, Raines, Potempa et al., 2009), with many migrating to other countries to seek higher wages, better research funding and career growth (Sigma Theta Tau International Honor Society of Nursing (STTI), 2010). In Rwanda there is thus a significant need to educate, recruit, and retain nursing faculty (Thuss, 2014). To effectively utilise teaching strategies that promote competencies for

nursing students, faculty need to be supported by the academic organisation and practice settings that will ultimately empower them in their teaching role (Thuss, 2014; Harerimana and De Beer, 2013).

In 2012, the Ministry of Health reported that the ratio of nurses and population was 1:1,476. It is also reported that 62.8% of nurses were working in rural areas in 2008 and 78% in 2010, and that 38.2% of nurses were working in urban areas in 2008 and 22% in 2010 (Rwanda Ministry of Health, 2012a). Due to the shortage of qualified nurses, some health facilities, mostly those in remote areas, are still employing A3 nurses, also called auxiliary nurses, who are no longer recognised by the NCNM. Auxiliary nurses have two years of secondary school with a training in basic nursing skills; they have no competence in nursing decision-making (WHO, 2010).

### 1.3.2.2 Nursing education in Rwanda

There are three levels of nursing education to prepare nurses for the provision of patient care. Nurses practising at district hospitals or in management positions at health clinics or hospitals generally have an A1 (diploma) or A0 (degree) designation with three or four years of post-secondary education. Before 1996, nurses who were trained in Rwanda received their education in governmental and private secondary school programs, where they were awarded a secondary school diploma (A2) (Anatole et al., 2013; Harerimana and De Beer, 2013). On the initiative of the Ministry of Health, Kigali Health Institute (KHI) was created in 1996, with the goal of solving the many and urgent problems created by the genocide against the Tutsis in 1994, during which many health workers were killed and others left the country going into exile (Kloppper and Uys, 2012).

In the same process of improving the quality of education, in 2007 the Ministry of Health promoted to tertiary level other five public nursing and midwifery schools: Byumba, Kabgayi, Kibungo, Rwamagana and Nyagatare. The competence-based approach was introduced in these schools in 2007 when they received the first students in the new three-year competence-based programs, which was a vital step in the government's plans to phase out lower-level A2 programs and transition to a workforce of A1 or higher-level professionals (BSNM, n.d; Kloppper and Uys, 2012; MINISANTE, 2007; Capacity Project, 2007). The competence-based approach in Rwanda was steered by the Ministry of Health, in collaboration with as stakeholders, such as APEFE (Association pour la Promotion de l'Éducation et de la Formation à l'Étranger) and BTC (Belgium Technical Cooperation) (MINISANTE, 2007).

Recently a shift has been made to adopt modular system in public higher education institutions as an attempt to address the limitations of the credit system (Mugisha, 2010): limited transferability of students; restricted multiple entries and exits of students; difficulty in comparability of graduates from the same educational system and reluctance in the wider region to accept graduates from the system. The credit system which was followed was criticised for having many courses of which some were no longer relevant to the needs of society, as described in the preface to the Rwanda National Qualification Framework (Mugisha, 2010). The recent restructuring of nursing and midwifery education system saw Byumba, Kabgayi, Rwamagana, Nyagatare and Kibungo nursing schools elevated to higher education institutions (Rwembeho, 2013). In 2013 they were allowed to graduate their first students since 2007 (Rwembeho, 2013). Currently, those schools are under the umbrella of the University of Rwanda (Thuss, 2014). The e-learning system in nursing education was introduced in January 2012 in five public schools of nursing and midwifery (Kabgayi, Rwamagana, Nyagatare, Kibungo and Byumba), and students were recruited from different health centres and hospitals with the aim of increasing quantity and quality of nurses in the country (Munyemana, 2012). Implementation of an e-learning platform in the Rwandan nursing schools took place after a pedagogical and technical evaluation, and Moodle was selected as a learning management system. Laurillard's conversational framework was the main evolutionary tool (Munyemana, 2012).

In 2013 many changes took place in Rwandan tertiary education following parliamentary legislation to merge 10 universities in the country into a single institution of higher learning, the University of Rwanda (Republic of Rwanda, 2013c; Karuhanga, 2013). The regional nursing and midwifery school programs have recently come under the administrative umbrella of the University of Rwanda and the College of Medicine and Health Sciences. There are seven campuses training nursing and midwifery students (Byumba, Kabgayi, Rwamagana, Nyagatare, Kibungo, Nyarugenge and Nyamishaba). Nursing education is provided through either a 4-year degree program at the university or a 3-year diploma of the nursing program in each one of five regional schools. As the MOH continues to support upgrading nursing education in Rwanda, a greater number of nurses with A1 and A0 designation are becoming available to practice and teach as healthcare professionals in this country (Thuss, 2014).

## **1.4 PROBLEM STATEMENT**

The use of technology in education requires a change in the educator's method of teaching (Govender and Govender, 2014), and the literature indicates the importance of facilitation for teaching and learning in higher education (Rienties, Brouwer and Lygo-Baker, 2013; T̄iru, 2013; Sithole, 2011; Jarosinski and Heinrich, 2010) – in particular, facilitation of online teaching and learning (Popov, Noroozi, Barrett, Biemans, Teasley, Slof et al., 2014; Popov, Biemans, Brinkman, Kuznetsov and Mulder, 2013; Rienties et al., 2013). Although e-learning is popular; several challenges have been noted including lack of resources, inadequate computer literacy, lack of quality e-content, difficulties in facilitating learners online, and language barriers (Najafabadi, Poorsadegh and Mirdamadi, 2013; Mengxue and Yan, 2012; Kader, 2007). Other deficiencies are lack of relevant ICT standards, lack of a firm framework to encourage students (Zhou and Xie, 2010; Kheswa, 2010; Bouhnik and Marcus, 2006) and low levels of ability among students and nurse educators to use ICT equipment (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur, 2012; Arthur, Kable and Levett-Jones, 2011). Other problems indicated in the literature are mismatch between technologies and context, culture and work practices, inadequate personal behaviour, resistance to change, lack of awareness and negative attitudes towards ICT, lack of administrative and technical end-user support, lack of systemic approach to implementation, and lack of follow-up (Parlakkilic, 2013; Kundi et al., 2010; Nawaz and Kundi, 2010; Purnomoi and Leeii, 2010).

The implementation of e-learning platforms in Rwandan nursing and midwifery schools has had a positive impact on nursing education (Republic of Rwanda, 2015b; Munyemana, 2012; Rwanda HRH, 2011). The introduction of e-learning in the schools was based on national needs, with the aim to improve nurses' and midwives' knowledge and skills using the modern methods of teaching and learning, to equip different health settings with sufficient well trained, qualified nurses and midwives, and upgrade the levels of nurses and midwives (Rwanda HRH, 2011). However some challenges have been reported associated with the use of ICT equipment by students and teachers and with language barriers (Munyemana, 2012), and no study has been conducted to analyse the utilisation of the e-learning platform and the tools used to support it. There is accordingly a need for a comprehensive study to analyse the utilisation of e-learning platform in Rwandan nursing and midwifery education and to develop a middle-range theory that may guide the utilisation of an e-learning platform in nursing education. Adequate

utilisation of an e-learning platform in nursing and midwifery education will have a huge impact in overcoming the shortage (noted above) of nurses and midwives in Rwanda.

## **1.5 AIM OF THE STUDY**

The aim of this study is two-fold:

- (i) To collaboratively analyse the utilisation of the e-learning platform in selected nursing school campuses at UR in Rwanda
- (ii) To develop a middle-range theory on the implementation of e-learning in selected nursing school campuses at UR in Rwanda

## **1.6 RESEARCH OBJECTIVES**

Within the context of this study, which followed an action research design, the objective was:

1. To analyse the processes and procedures involved in the utilisation of the e-learning platform in selected nursing school campuses at UR [Phases 1, 2 and 3]
2. To explore the perceptions of the users of the e-learning platform in selected nursing school campuses at UR [Phases 1 and 3]
3. To explore the support provided to the users of the e-learning platform in selected nursing school campuses at UR [Phases 1, 2 and 3]
4. To describe the intervening conditions that pertain to the utilisation of the e-learning platform [Phases 1 and 3]
5. To develop a middle range theory describing the emerging concepts to guide the teaching and learning process in nursing education institutions in Rwanda. [Phase 4]

## **1.7 RESEARCH QUESTIONS**

### **1. The specific research questions related to objective one**

- How is the e-learning platform currently utilised in selected nursing campuses at UR?
- How do nurse educators facilitate the e-learning in selected nursing campuses at UR?
- How do students use the e-learning platform?
- How are the users of the e-learning platform supported in the selected nursing campuses, at UR?

- What intervening conditions facilitate or hinder the use of e-learning platform in the selected campuses at UR?
- 2. The specific research questions related to objective two**
- What are the perceptions of the users of the e-learning platform in selected nursing school campuses at UR?
- 3. The specific research questions related to objective three**
- How are the users of the e-learning platform supported in the selected nursing campuses at UR?
- 4. The specific research questions related to objective four**
- What are the antecedents or casual conditions that led to the development of a middle-range theory of using e-learning platform in nursing education?
  - What forms the context for the e-learning platform in nursing schools?
  - What are the roles of the different key players?
  - What are the action and interaction strategies in the utilisation of the e-learning platform?
  - What are the intervening conditions that mediate variables in the utilisation of an e-learning platform in nursing education?
  - What intended or unintended consequences or outcomes are achieved during the development of a middle-range theory for using e-learning platform?
- 5. The specific research questions related to objective five**
- What is the core concept in this emerging e-learning platform utilisation middle-ranged theory?
  - What are the main concepts and subconcepts in the emerging middle-ranged theory?
  - What is the relationship between and amongst the concepts and sub-concepts in this theory?
  - What are the assumptions emerging in this theory?

## **1.8 SIGNIFICANCE OF THE STUDY**

ICT is central to Rwanda's Vision for 2020, and ICT in education is one of the core pillars (Republic of Rwanda, 2012c; Farrell, 2007). Another vision of the Rwandan government is to transform its citizenry to a knowledge-based society through ICT. According to Mukamusoni (2005), sufficient and well-qualified teachers and health professionals are cornerstones of the Millennium Development Goals (MDGs) [replaced by the Sustainable Development Goals

(SDGs) in September 2015] to which government in Rwanda is committed to the development of the country. This study will give insight into the current situation of e-learning in nursing education in support of these goals. The middle-range theory of e-learning platform utilisation developed in this study will enhance nursing education and curriculum development. This will assist in improving the general effectiveness of e-learning platform utilisation among students, nurse educators, ICT managers and other health professionals.

The findings will improve the quality of education by enhancing the effectiveness of e-learning platform utilisation. This is based on the fact that e-learning promotes student-centred approaches where students are self-directed, learn collaboratively, and do research, which in turn promotes inquiry-based learning. In this way students and nurse educators will be familiarised with technology such as computers, internet, learning management systems, and ICT in general, enabling them to access anytime and anywhere updated information that will help them when they graduate to provide evidence-based practice. It is the best way to address the shortfall in qualified nurses in the country.

The findings will assist students and teachers to acquire professional and personal development and growth through student-centred approaches such as adult learning, self-directed learning, active learning, critical thinking, collaboration and putting theory into practice, to promote evidence-based practice.

The findings are responsive to national policies and legislation relating to using ICT in education, and particularly in the education of nurses and midwives, thus helping the country achieve its Vision 2020.

For the health systems, it is expected that the findings will contribute to the awareness of the importance of e-learning, in effecting a rapid increase in the nursing and midwifery workforce in a resource-constrained context, and in addressing the shortfall in qualified nursing and midwifery workforce in various clinical settings.

The findings will make a contribution to nursing practice by producing competent graduates, and will help to correct bad nursing practice routines by integrating newly acquired knowledge in nursing practice, thus improving the services provided to the clients in various clinical settings. The findings will also trigger further research in the same area.

## **1.9 OPERATIONAL DEFINITIONS**

### **1.9.1 E-learning**

The term e-learning, in the most general sense, refers to use of computers and information ICT in the teaching and learning process with the intention of enhancing its effectiveness, which can be done offline or online (Zhou and Xie, 2010; Naidu, 2006). In this study e-learning refers to learning based on electronic media including online and offline learning, using electronic resources, as recommended by Nagarajan and Jiji (2010). In this study, e-learning includes educational activities that are carried out by individuals or groups working online or offline, and synchronously or asynchronously using electronic devices, as defined by Naidu (2006).

### **1.9.2 E-learning platform**

A learning platform is a set of interactive online and offline services that provide learners with access to information resources to facilitates teaching and learning by using the internet (FAO, 2011; Naidu, 2006). An e-learning platform is a tool which is a virtual equivalent of a university (Al-Dahoud, Woda and Walkowiak, 2010). In this study, an e-learning system is defined as a platform used in nursing schools to supplement the traditional classroom, which allows the nursing schools to make efficient use of available resources to enhance the teaching and learning experience, disseminate knowledge, and evaluate students and student management.

### **1.9.3 Facilitation**

Facilitation is a way of teaching which embraces reflective dialogue leading to critical reflective learning (Larrivee, 2008; Brockbank and McGill, 2007; Gray, 2007; Chenoweth, 1998; Reid, 1993); initial facilitation by teachers leads to self-facilitation by student learners (Brockbank and McGill, 2007). In this study, facilitation means strategies put in place to help students construct their knowledge in an e-learning platform – using available resources with the assistance of nurse educators.

### **1.9.4 Information and Communication Technology (ICT)**

ICT includes a range of tools and systems: computers, worldwide web, audio- and videotape, satellite broadcasts, interactive TV, radio and CD-ROMs used as a medium of teaching and learning (Filip, 2000). In this study, ICT refers to use of computers, internet and other electronic

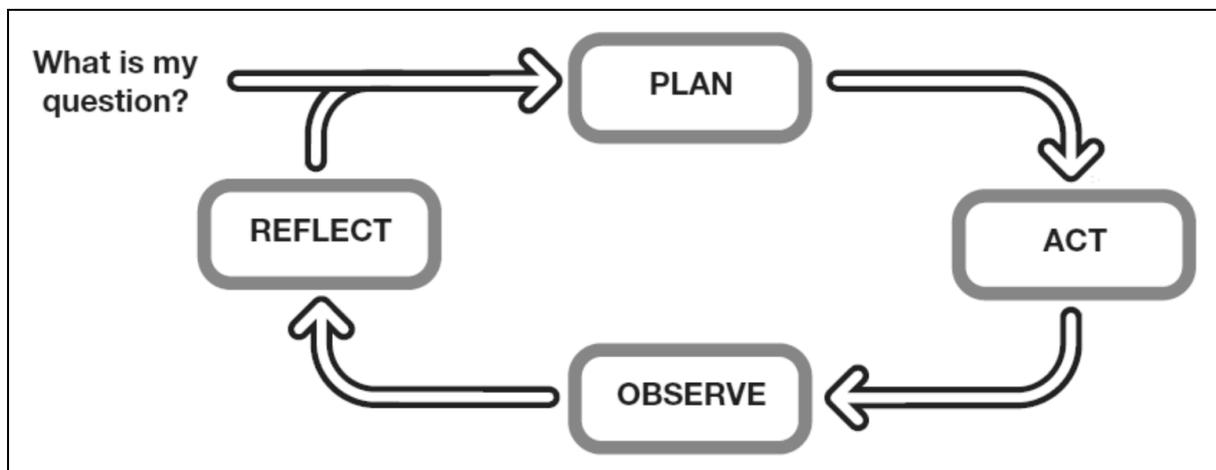
communication media in teaching and learning, in order to provide accessible and high-quality content to the students based on their experiences.

### 1.9.5 Middle-range theory

As stated by Strauss and Corbin (1990), a middle-range theory refers to a set of constructs, themes or relationships that offer an explanation of the phenomenon. In the context of this study, the middle-range theory offers an explanation of the relationship between concepts, constructs and variables that describe the process of using e-learning platform in nursing school education in Rwanda.

## 1.10 CONCEPTUAL FRAMEWORK FOR THE STUDY

This study was directed by participatory action research (PAR). The roots of PAR can be traced to the work of Kurt Lewin (1946), who is considered the forefather of action research (Gillis and Jackson, 2002). Action research is research has multiple phases (four in this study) and is spiral in nature. Each phase contains the following cycles: planning, acting, observing, and reflecting (Koshy, 2005; O’Leary, 2004; Kemmis and McTaggart, 2000; Elliot, 1991; Susman, 1983; Lewin, 1946).



**Figure 1-1: Action research process model adopted from Hall and Keynes (2005) and Lewin (1946).**

### 1.10.1 Planning cycle

Planning frequently begins with a general idea. For one motive or another, it seems desirable to attain a certain goal (Carr and Kemmis, 1986). Lacking a plan, one is likely to find oneself shifting aimlessly through piles of data without any clear purpose. Such an approach will most

likely result in superficial findings (Henning, Stine and Kelly, 2009). In this study, when planning an action research study, researchers decided on the goals and purposes of the study, decided on a research question to guide the study, selected the research participants, and determined the method of data collection. In each phase of this study, the above-mentioned criteria were strictly followed.

### **1.10.2 Acting cycle**

This means implementing a plan, collecting and compiling evidence, questioning the process, and making changes as required (Carr and Kemmis, 1986). In the data collection phase, actions are taken to carry out the action research project. These actions include implementing new strategies and collecting data on them. In education research, data collection could include administering tests, observing students, and conducting surveys and interviews (Henning et al., 2009). Collection of data is an important step in deciding what action needs to be taken. A variety of data sources is used, in order to know what is happening in the teaching institutions and classrooms (Ferrance, 2000). For the purpose of this study, actions were taken based on emerging concepts that needed a rapid intervention. These actions included implementing new strategies and collecting data on them.

### **1.10.3 Observation cycle**

In the observation cycle, also called the analysis phase, researchers carefully examine and analyse their data. In education research, the analysis could include observations of student interactions, analysis of student work, analysis of surveys and interviews, analysis of pre-and post-tests or analysis of standardised achievement tests. Analysis during action research consists of a two-step process. First, action researchers should construct an objective description of student performance. This description should be thorough, detailed, objective, and as free from judgments or inferences as possible. The more detached and objective the description, the better it lends itself to analysis and interpretation. Second, to multiply their observations action researchers should examine their data from different perspectives.

In this study, the observation cycle was followed by interpretation of the interaction with the students and nurse educators, ICT managers and campus managers in data collection via in-depth interviews, focus group discussion and surveys, and in the seminar training of nurse educators on the use of Moodle. This helped the research team to move to the next phase of the action research project. This was accomplished by making comparisons and contrasts,

integrating different observations in different ways, and viewing the data through different conceptual lenses by analysing the evidence and collating the findings, and discussing the findings with research team and/or colleagues, as recommended by Henning et al (2009) and Carr and Kemmis (1986).

#### **1.10.4 Reflection cycle**

The reflection phase consists of a three-step process. The first step is interpreting and explaining the observations. When interpreting your data, it is useful to generate as many plausible explanations as possible. The researcher and the research team will find having a variety of explanations is helpful in the second step of the reflection process, which is developing new strategies. Most new strategies come from one of the following four sources: past experience of the researcher and the research team, data from the researcher's study, techniques shared by other teachers, or the educational literature. The third step of the reflection process is to justify the new strategies by supporting them with data, best practice, educational research, or educational theory. Justification is critical because the thinking processes associated with developing a new strategy are often based on inspiration or intuitive thinking. Justification requires a more carefully reasoned rationale based on an analytical approach that links data, literature, and past experience (Henning et al., 2009). Carr and Kemmis (1986) argue that the cycles continue with evaluating the first cycle of the process implementing the findings or new strategy revisiting the process. In this study, the reflection cycle was done by interpreting the findings based on the grounded framework as recommended by Strauss and Corbin (1990). Together, the research team and the principal researcher generated explanations which assisted in developing new strategies to put in place based on the literature review and past experience, and lastly this cycle helped to justify new strategies by supporting them with data, best practice, educational research, educational theory and technological frameworks and models.

### **1.11 CONCLUSION**

This chapter covered the background to the study, research context, problem statement, research objectives, research questions, significance of the study, operational definitions and conceptual framework. The next chapter covers the concepts and theories underpinning this study.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

The topic that directed the methodical information reported in this chapter search was “An analysis of the utilisation of e-learning platforms in selected nursing schools in Rwanda”, with the intention of establishing ways in which e-learning use can be optimised. The literature search included information on the use of learning platforms in general education and in nursing education in particular, covering both local and international material and a number of topics: The literature search included the following computer-assistance databases: MEDLINE (Medical Literature Online), Academic Search Premier, Nexus, CINAHL (Cumulative Index to Nursing and Allied Health Literature), Google and Google Scholar, Science Direct, ERIC (Educational Research Information Centre).

Keywords used included e-learning, blended learning, hybrid teaching, online teaching, e-learners, e-learning in education, ICT in education, computer-mediated learning, facilitation of e-learning, internet in health professionals, benefits of e-learning, challenges to e-learning.

#### **2.2 E-LEARNING IN EDUCATION**

E-learning offers a number of benefits, and it includes teaching and learning that is supported by information communication technologies, with the computers and internet being at the centre. This includes all the tasks performed out by individuals or people, and they are carried out synchronously or asynchronously, connected to internet or not, and other ICT tools (Baliya, 2012; Naidu, 2006).

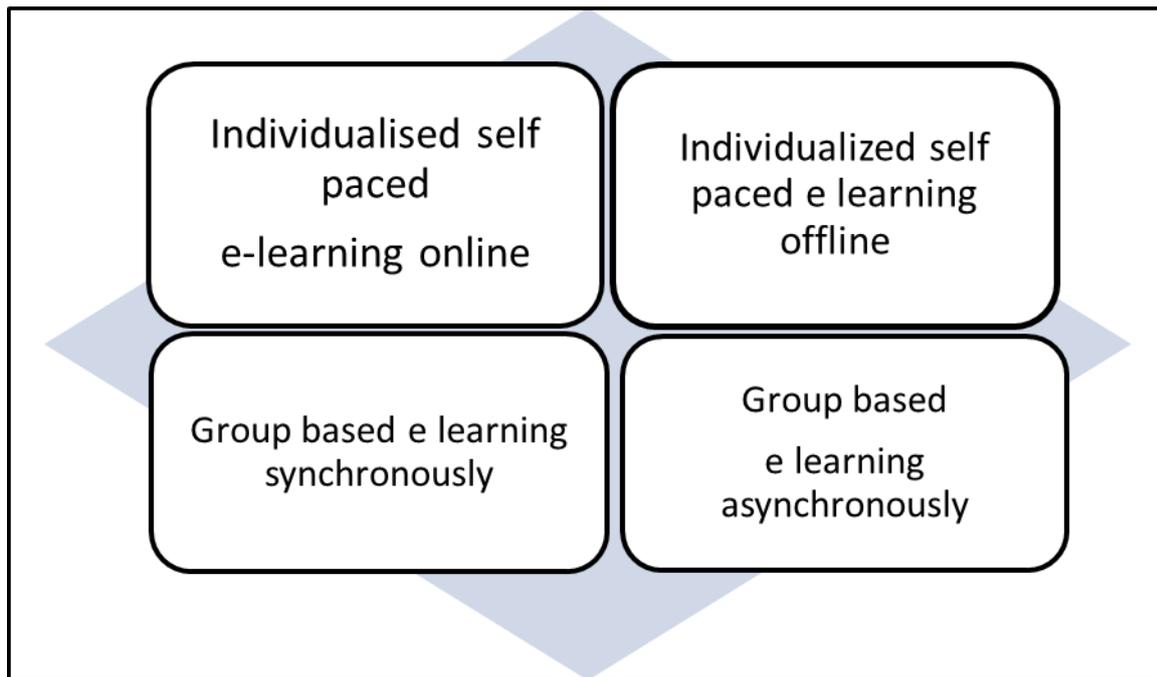


Figure 2-1: E-learning modalities. Adapted from Naidu (2006)

Individualised self-paced e-learning online is done in situations where a student access educational resources with the aid of internet. This is a type of learning where students learn alone, and who is self-directed in collecting information from the web or networked computers (Baliya, 2012; Naidu, 2006). Individualised, self-paced e-learning offline means that individual students utilise resources while offline or not connected to internet, such as saved e-books, and compact discs (Baliya, 2012; Naidu, 2006).

Synchronous group-based e-learning takes place in situations where students work in groups using the web in real time. It comprises audio or video conferences, or other forms of text-based projects such as the use of video conferencing equipment, Skype and other social networks (Brown, Denny, Butler and Findlay, 2014; Baliya, 2012; Naidu, 2006). In asynchronous group-based e-learning, a group of students performs activities over the web, but collaboration and exchange take place with a time delay. This kind of activities occurs in situations like on-line discussions, using e-mails, forum discussion platform within learning management systems (Brown et al., 2014; Baliya, 2012; Naidu, 2006). The literature shows that these can adopt an enhanced approach (Barak and Levenberg, 2016), a blended approach (Ellis, Pardo and Han, 2016; Hubackova and Semradova, 2016; Matukhin and Zhitkova, 2015; Smythe, 2011; AL-Hunaiyyan, Al-Huwail and Al-Sharhan, 2008; Sharpe, Benfield, Roberts

and Francis, 2006) or an online approach (Broadbent and Poon, 2015; AL-Hunaiyyan et al., 2008; Khan, 2005).

E-Learning has become a worldwide phenomenon in the new technological economy, crossing oceans and reaching to remote villages. The entry visa for e-learning is a computer and an internet connection (Hogan and Kedrayate, 2011). Since 2000 there has been an explosion of growth in e-learning, a blended approach that combines online and face-to-face training (Hogan and Kedrayate, 2011). Integration of Informatics competency in a nursing curriculum is important for continuing success throughout the education and career of contemporary nursing students. As enrolment in nursing programs increases, diversity in the population of students from many different cultural and socioeconomic backgrounds presents a challenge for faculty in addressing the unique learning needs of each student (Edwards and O'Connor, 2011). Edwards and O'Connor (2011) state that adequate computer literacy allows the beginning nursing student to use learnings resources placed on the web by the institutions. Frustration may occur when students struggle with basic informatics competency, frequently leaving them unable to use web-based learning contents.

Schools of nursing across the globe are charged with providing students with the best possible learning opportunities in the healing arts (O'Shea, Planas, Quan, Kazer, Babington and Grenier, 2013). Traditionally, these opportunities have taken the form of nursing theory delivered through a variety of classroom teaching techniques, laboratory experiences in which students practice clinical skills, and clinical environments in which students care for the patients. This teaching and learning is well-rooted in nursing education and provides a framework for the successful preparation of clinicians who are able to care for the patient across environments (O'Shea et al., 2013). Nursing education has therefore made and will continue to make, valuable contributions to adult, continuing, and professional education in the twenty-first century (Salyers, Carter, Cairns and Durrer, 2014).

The literature reveals that e-learning can assist to overcome geographical and individual boundaries which are characteristic of traditional educational systems. It allows students have access to information and collaborate with peers and teachers irrespective of the time and space (Rabiee, Nazarian and Gharibshaeyan, 2013; Pawlowski, 2006). Anderson (2010) argues that teachers should adopt student-centered approaches, in order to make students more responsible for their own learning. This can also mean giving to students opportunities to set their goals,

and participate in their assessment. In student-centred classroom tasks, students frequently work together in small groups and roles for each member are clarified. It is important to evaluate students' ICT skills upon admission to provide information of required skills to enable the student to perform at tertiary level with technology. Without basic informatics skills, students usually fall behind the first three to four weeks of the semester (Edwards and O'Connor, 2011).

The importance of ICT literacy in nursing practice is well documented throughout the literature. Incorporating computer technology into the nursing curriculum will facilitate the student to use available resources in order to provide quality of care, thus promoting evidence-based practices (Edwards and O'Connor, 2011). Bond (2004) argued that computer informatics should be presented as an entry condition for the nursing profession. It is indispensable to equip students computer skills required for their education and in practice as nurses (Edwards and O'Connor, 2011). Providing unique opportunities as it does for education, the ICT, according to UNESCO (2003), was in fact invented specifically for education. Limited technical supports have been considered and designed especially for academic purposes, and teachers have constantly had to examine the didactic options of various inventions to define how they can be effectively used in education. It is very vital to neither overemphasise nor undervalue the importance of the internet in education in defining its role and place in the educational process (UNESCO, 2003). The educational theories and technology model will continue to influence the integration of ICT in tertiary education (UNESCO, 2003).

The literature indicates that a number of educational theories have influenced, and continue to influence, e-learning, such as behaviourism, cognitivism, constructivism, connectivism, and learning as a social phenomenon. From a behaviourist perspective in using the internet, students are informed about the course outcomes, and in return they made a judgment whether or not they reached the goals of the online lesson, and students need to be assessed for the achievement of these goals (Alzaghoul, 2012; Anderson and Elloumi, 2003).

In cognitivism, it is argued that learning takes into considerations memory, motivation, and thinking, and that reflection is of a high importance in learning. Approaches to facilitate perception and responsiveness to online teaching and learning require teaching approaches that allow the students to recover existing information from long-term memory to and have a better understanding of new information (Alzaghoul, 2012; Anderson and Elloumi, 2003; Bonk and

Reynolds, 1997). In constructivism, UNESCO (2003), states that designing learning strategies and knowledge is in line with the internet as an academic tool. UNESCO (2003) further explains that in this type of instruction the learners are the centre of the learning process. The constructive learning considers internet to be a tool that allows trial and error, giving the opportunity to construct own knowledge (Alzaghoul, 2012; UNESCO, 2003).

The literature indicates that the theory of connectivism emerged in recent years, (Downes, 2006; Siemens, 2006; Siemens, 2004). It is argued that with the explosion of ICT, learning is not under control of the students. With dynamic learning environments, and innovative teaching approaches, students have to unlearn what they have learned in the past, and learn how to learn and appraise new information. According to UNESCO (2003), considering the internet as an appropriate academic tool for learning is a social phenomenon. The achievement of knowledge is based on the collaborations, and interaction of Individuals. The internet supports a collaborative and interactive learning environment where people learn from one another experience.

A number of authors have developed frameworks and models to explain the learning and teaching process and in particular the use of ICT in education, technology acceptance model, Khan's octagonal framework, the Laurillard conversational framework, Mayes and Fowler's framework, Salomon's e-tivities approaches, and the demand-driven learning model. Furthermore, theories and styles of learning describing learning in various ways have been developed. A learning theory provides a theoretical model of a human's learning process (Kanninen, 2009). Learning styles are progressively integrated into technology-enhanced learning and a lot of research work is done in this area (Graf, Viola, Kinshuk and Leo, 2002). The literature reveals a number of learning styles which include the visual-auditory-kinaesthetic (VAK) learning style model (Çalışkan and Kılınc, 2012; Gilakjani and Ahmadi, 2011; Foster, 2008; Miller, 2001), Kolb's learning style model (Foster, 2008; Kolb, 1984), Honey and Mumford's learning style model (Honey and Mumford, 1992) and Felder-Silverman's model (Graf et al., 2002).

Considering different students' learning styles would help both help teachers recognise the roots of some academic challenges and lead to better planned, differentiated instruction (Dunn and Honigsfeld, 2013). It would also help the student to recognise their weaknesses and their strengths in their learning (Popescu, 2009; Montgomery and Groat, 1998). Learning styles

research has provided to educators new directions for making changes in their classrooms. The single most pervasive change has been to open classrooms to more than one approach to intellectual work (Popescu, 2009; O'Connor, 1997).

The theoretical fundamentals of e-learning utilisation – technology in education, frameworks and models, and learner-centred models – are key to the success of e-learning in nursing education if adopted effectively. Several advantages of e-learning have been documented in various studies such as flexibility and possibilities for self-directed learning (Farrell, Cubit, Bobrowski and Salmon, 2007b). The literature shows that e-learning facilitates social cohesion, and collaboration among students, beyond the school settings (Smith et al., 2009; Kelly et al., 2009; Maag, 2006). ICT offers nursing a great opportunity to access a wider range of updated information, to be used when providing quality of care to patients. It offers opportunities to practising nurses to update their knowledge, and integrating up-to-date knowledge into their everyday practices (Royal College of Nursing, 2006).

### **2.3 TYPOLOGIES OF ICT APPLICATIONS IN EDUCATION**

According to UNESCO (2003), the use of the internet in education is perceived as the usage of ICT teaching and learning. Dryli and Kinnaman (2013) argue that the internet facilitates learners to search for information, as well as to become critical thinkers, and problem solvers through cooperation and collaboration. The methodical investigation of experiences in using the internet in teaching infers that the types of such application offer a possibility of comparing and generalising the findings, that might be pre-identified and pre-defined (UNESCO, 2003).

The technology-oriented approach is furthestmost used across the globe. This has open doors to distance learning, web-based learning, and technologies that facilitate interactive collaboration are used such as audio-conference, electronic mail, videoconference, telephone, fax, search engines and databases (UNESCO, 2003).

**Table 2-1: Internet tools for online teaching adopted from Groves, Lee and Stephens (1999)**

<b>Virtual degree (skills level)</b>	<b>Internet tools</b>
Low-level	Usage of e-mails or discussion lists
Medium-level	Discussion lists and online lecture notes delivered via the web
High-level	The above plus interactive web tutorials, designed specifically for the course and students interaction and production of their own web pages
Expert	The above plus, virtual environments, giving the participants possibility of cooperative activity (like multi user dimension, MUD)

Table 2-1 shows the skills level in using internet. At a low level, there is the use of Internet tool for e-mails and discussion. At a high level, on top of the activities, there are interactive tutorials designed specifically for the course and the learner's collaboration and creation of their own webpages. There is also the level of Expert; this level includes the activities mentioned on two previous levels, plus virtual environments giving participants the possibility of cooperative activities (Groves et al., 1999). Ellsworth (1994) cited in UNESCO (2003), proposes a grouping of Internet resources in harmony with the collaboration between stakeholders of the educational process as a way of resolving various tasks using Internet resources with different combinations of students, teachers, and curriculum goals. There is a collaboration of teachers and the students in teaching and learning process; communication of students, and teachers in searching information from the web and research projects.

Harris (1995), introduces activity structures that would facilitate implementation of online teaching and learning (Table 2-2).

**Table 2-2 Type of online interaction Adapted from Harris (1995)**

<b>Kind of interaction</b>	<b>Activity structures</b>
Interpersonal interaction	Key pals
	Global classrooms
	Electronic appearances
	Electronic mentoring
	Impersonation
Information collection	Information exchanges
	Database creation
	Electronic Publishing
	Tele-field trip
	Pooled data analysis
Problem solving projects	Information searches
	Parallel problem solving
	Serial creation
	Simulation
	Social action projects

One of the possible approaches was introduced by Harasim (1989) and Rapaport (1991), and developed by Paulsen (2011; 1995) for teaching and learning. Paulsen recommends four communication paradigms (communication approaches) and related varieties of “pedagogical techniques” need to be considered as a foundation for using different internet applications. He proposes that these “pedagogical techniques” should be understood as “the ways of accomplishing teaching objectives”. This typology is presented in a summarised form in Table 2-3.

**Table 2-3 Methods, techniques and devices applicable in CMC-based teaching systems (1995; Internet World Stats, 2011)**

<b>Ways of communication</b>	<b>Single</b>	<b>One to one</b>	<b>One to multitude</b>	<b>Multitude to multitude</b>
<b>Pedagogical Techniques</b>	Online database Online magazines Online applications Program libraries Online hobby groups Interview	Educational contracts Preparation course internship Correspondence teaching	Lecture Symposiums Publications	Discussions Simulations or games Role paying Discussion groups Transcripts based assignments Brain storming Delphi Technique Nominal group techniques Forums Project groups
<b>Types of CMC-devices</b>	Facilities to work with online resources	e-mails	List servers, BBS and Web	Usenet, BBS, and computer teleconference

Table 2-3 shows the computer-mediated communication (CMC) -based teaching mechanisms where two communication paradigms are considered: pedagogical techniques and types of CMC devices. In pedagogical techniques, the single communication paradigm includes online

databases, online magazines, online applications, program libraries, online hobby, groups' interview. In relation to types of CMC tools, infrastructures to use online resources (Internet World Stats, 2011; 1995) is the device type associated with the single communication paradigm.

With one-to-one communication; the focus in pedagogical technique would be on educational contracts, preparation course internship and correspondence teaching, and the corresponding CMC-device would be e-mail. With one-to-multitude communication, the focus in pedagogical technique would be on lectures, symposiums and publications, and the corresponding CMC devices would be list servers, BBS (Bulletin Board System) and internet. With multitude-to-multitude communication, using pedagogical techniques, the focus in pedagogical technique would be in discussions, simulations or games, role playing, discussion groups, assignments, projects, and the corresponding computer-mediated communication tools would be Usenet, BBS, and computer teleconference (Internet World Stats, 2011; 1995).

Davies (1997), cited in UNESCO (2003), builds her own typology of Internet usage in teaching and learning based on the task types in all facets of teaching and learning process, as set out in Table 2-4.

**Table 2-4: Typology of Internet usage in education Adapted from Davies (1997) cited in UNESCO (2003)**

Typology	Activities
Web based courses	Fully web placed courses Major component of the course on the web Support on the web Web contains only the information on the course
Educational administration	Online admission Course registration Tuition payment Administrative tasks
Development and communication skills	Thematic student to student correspondence, including students from abroad
Electronic publishing	Creating hypermedia web pages by students Issuing of online journals
Mining information	Database browsing Electronic encyclopaedia
Ask the experts	E-mailing question to the most famous experts
Electronic appearances and virtual realization	Virtual conferences or forums
Simulations	MUD, MOO, Moodle
Involvement in research projects	Shared global search, collection and analysis of information
Professional networking	Exchange of experience and information via synchronous and asynchronous teleconferencing and discussion list

The integration of ICT in the classroom is a cornerstone to the success of e-learning. Information and communication technology, or ICT, is defined as the combination of

informatics technology with other related technologies – specifically technological tools. It contains tools that are capable of saving, recover, manipulate, diffuse or collect materials by electronic means such laptops, TV, and tablets (Hyeoncheol and Injin, 2007; Anderson, Brown, Murray, Simpson and Mentis, 2006). Anderson lists four stages of ICT integration: emerging, applying, infusing and transforming (Anderson, 2010).

Information communication technologies (ICT) that are already familiar components in business are finding their way into education at all levels in many parts of the world. Such technologies, however disrupt education as they require changes in the teaching approaches and the structure of the institutions (Ally and Khan, 2015). People on the other hand, can resist changes because it challenges them and drives them out of their comfort zones (Latchem and Jung, 2010 cited in Ally and Khan, 2015) therefore managing the change during the transition phase is crucial (Kotter, 1996) and challenging task for any leader (Tibi and McLeod, 2010). University experience such challenges during the transition from tradition way of teaching to more e-learning based teaching and learning (Ally and Khan, 2015).

Though e-learning technologies are beginning to be used in education institutions, their role entirely depends on the acceptance and execution of required change in the thinking and behaviour of the developers and users of institutions. It is very hard to change the behaviours, cultural bonds and lifestyle of the users in the educational institutions (Parlakkılıç, 2014b). Managing the changes during ICT integration in the classroom, and in particular e-learning is very importation. Anderson (2010) provide a model on how ICT can be integrated into education.

The model in Figure 2-2 has two dimensions: technology and pedagogy. Technology refers to all the information and communication technologies that ICT comprise, and pedagogy is the art and science of teaching. The technology dimension is a continuum that represents increasing extent and variety of ICT in use. The pedagogy dimension is also a continuum and represents changing teaching practices resulting from the adoption of ICT. Within these two dimensions are seen four stages that classes or schools typically pass through in their integration of ICT. Sometimes the number of stages varies. However, there is a general consensus that the integration of ICT in education proceeds progressively in a series of broad stages denoted in the model as *emerging*, *applying*, *infusing* and *transforming* (Anderson, 2010).

Specialized in the use of ICT	<b>TRANSFORMING</b>	Creating innovative learning environment
Understanding how and when to use ICT	<b>INFUSING</b>	Facilitating learning
Learning how to use ICT	<b>APPLYING</b>	Enhancing traditional teaching
Becoming aware of ICT	<b>EMERGING</b>	Supporting work performance
<b>LEARNING ABOUT ICT</b>	<b>STAGES OF ICT USAGE</b>	<b>PEDAGOGICAL USAGE OF ICT</b>

Figure 2-2 Stages of ICT integration Adapted from Anderson (2010)

## 2.4 BLENDED LEARNING IN EDUCATION

According to King and Arnold (2012), technology has empowered tertiary institutions to provide blended and fully online courses. Blended learning is becoming progressively a widespread method of content delivery in tertiary education, particularly at the graduate level, because of the scheduling flexibility and the ability to respond to the needs of a bigger number of students (Ho, Lu and Thurmaier, 2006 cited in King and Arnold, 2012).

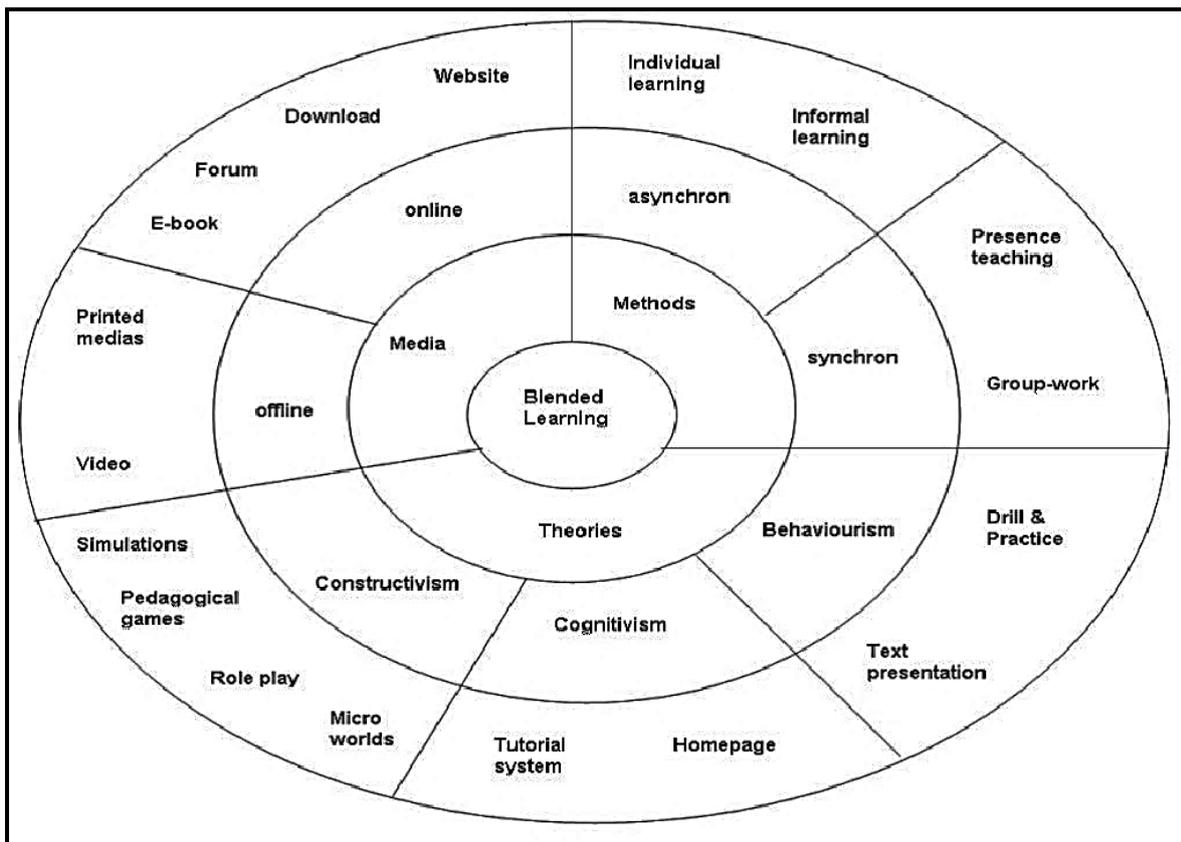


Figure 2-3: Conceptual framework for holistic approach to blended learning by Wiepke (2006)

### 2.4.1 Concept of blended learning

According to King and Arnold (2012), blended courses are described as those that combine in-class and online instruction with 30% to 70% online content. This percentage may vary by teaching institutions. The blended model includes both face-to-face (physical) and asynchronous (virtual) instruction (King and Arnold, 2012; Precel, Eshet-Alkalai and Alberton, 2009; Holenko and Hoić-Božić, 2008; Slevin, 2008). Blended courses have the potential to incorporate the strengths of synchronous and asynchronous learning (Vaughan, 2007; Ho, Lu and Thurmaier, 2006). Figure 2-3 shows rings of blended learning as addressed in constructivist, cognitivist and behaviourist theories, in asynchronous and synchronous teaching and communication, and in online and offline media.

**Synchronous learning methods:** Wiepke (2006) states that synchronous learning could be attendance teaching, or group work. According to Motycka, Onge and Williams (2013) video conferencing is one form of synchronous learning which allows “real time” interaction between instructors and students. Videoconferencing may reduce time and travel costs for faculty and students, and also allows the introduction of several different teaching aids such as computers and CD-ROMs. From an educational perspective, videoconferencing may be used for meetings, teaching, management, or interviewing (Motycka et al., 2013). Modern videoconferencing systems can receive input from almost any other digital system and can be accomplished using videophones, plug-in cards for personal computers (PCs), or table top videoconferencing systems (Reynolds, 2008). Synchronous Learning includes also: Virtual Classroom / Online Lecture, Online Chat / Instant Messaging, E-Conference, Online assessment, Interactive Whiteboard as defined by Chew (2009).

**Asynchronous learning methods:** According to Wiepke (2006), asynchronous learning can be individual or informal learning. Motycka et al. (2013) argue that mobile learning (mLearning) is a form of asynchronous learning that makes use of portable wireless devices such as media players, smartphones, and personal digital assistants. mLearning makes course material portable, making it possible for students to take advantage of any unexpected free time (Motycka et al., 2013). A form of mLearning called podcasting allows students to download broadcasts published to the Internet on a portable device which can then be watched at the student’s convenience (Evans, 2008). Bell and colleagues report on a system called the Canterbury ‘Digital Lectures’ system. The purpose of this form of asynchronous learning is to

automatically capture and index lecture content which then allows for flexible delivery of course content. This system is beneficial to students in that there is no requirement to be in a certain place at a specific time. It was also designed such that instructors were not required to alter their teaching methods (Bell, 2001 cited in Motycka et al., 2013).

**Online versus offline:** According to Wiepke (2006), online media include websites, forums, downloads and e-books, whereas offline media include printed media and videos.

**Constructivism, cognitivism, behaviourism and blended learning:** According to Wiepke (2006), the use of blended learning in constructivism may include simulation, pedagogical games, role plays, or microworlds. Cognitivism in blended learning includes tutorial systems and home pages (Wiepke, 2006). Behaviourism in blended learning includes text presentations and Drills and practices (Wiepke, 2006).

#### **2.4.2 Levels of blended learning**

According to Graham (2006), blended learning can be addressed at four different levels: activity level, course level, program level and institutional level. Across all four levels, the nature of the blends is determined either by the learner or by the designer/instructor. Blending at the institutional and program levels is often left to the discretion of the learner, while designers/instructors are more likely to take a role in prescribing the blend at the course and activity levels (Graham, 2006). (i) **Activity-level blending:** Blending at the activity level occurs when a learning activity contains both F2F (face-to-face) and CM (computer-mediated) elements (Graham, 2006). (ii) **Course-level blending:** Course-level blending is one of the most common ways to blend. A course-level blend entails a combination of distinct F2F and CM activities used as part of a course. Some blended approaches engage learners in different but supporting F2F and CM activities that overlap in time, while other approaches separate the time blocks so that they are sequenced chronologically but not overlapping (Graham, 2006). (iii) **Program-level blending:** It is often observed that blends in higher education occur at the degree-program level (Graham, 2006). Blending at a program level often entails one of two models – a model in which the participants choose a hybrid of teaching and learning, between classroom face to face subjects and web-based or online subjects or one in which the combination between the two is recommended by the program (Graham, 2006). (iv) **Institutional-level blending:** Some institutions have made an organisational obligation to blending face-to-face and computer-mediated teaching and learning. Many companies, as well

as institutions of tertiary education, are designing models for blending at an institutional level (Graham, 2006).

Learning is an inherently social process, where different strategies for effective learning can be implemented (El-Mowafy, Kuhn and Snow, 2013; Strobl, 2007). The use of new technologies in teaching and learning, such as e-learning, can assist in both the enhancement of traditional teaching methods and the development of students' technical skills. At present, there are several e-learning technologies available (Garrison, 2011). Many of these address mobility of student learning, which enables students to learn anywhere, anytime and with various devices (Herrington, Schrape and Singh, 2012). These include learning management systems providing a virtual platform for students to access teaching resources and interact with teachers, web-based flexible learning environments, and media to encourage collaborative learning among students. In regard to developing technological skills, a wide range of technologies can be used to assist in training students. These can range from videos for demonstration, recording and reflective analysis purpose to simulation-based e-learning (SIMBEL) systems (El-Mowafy et al., 2013). Graham, Henrie and Gibbons (2013) present a number of practical patterns of blended learning in higher education, K-12 education, and corporate training (Table 2-4).

**Table 2-5: Categories of blended learning models (Graham, Henrie and Gibbons, 2013)**

<b>A. Higher Education Twigg (2003)</b>	<b>B. K-12 Education Staker and Horn (2012)</b>	<b>C. Corporate Training Rossett and Frazee (2006)</b>
<b>A.1 Supplemental</b> <ul style="list-style-type: none"> <li>▫ Supplemental online materials</li> <li>▫ Online quizzes</li> <li>▫ Additional online activities</li> <li>▫ Flexibility of online activities for computer lab or home</li> </ul>	<b>B.1 Rotation</b> <ul style="list-style-type: none"> <li>▫ Rotation among learning modalities, at least one of which is online</li> <li>▫ Station Rotation—rotations within a classroom</li> <li>▫ Lab Rotation/ rotations within locations on a school campus</li> <li>▫ Flipped Classroom/ rotation within a given course or subject including online remote (at home)</li> <li>▫ Individual Rotation/individually tailored rotation schedule for a course or subject</li> </ul>	<b>C.1 Anchor Blend</b> <ul style="list-style-type: none"> <li>▫ Introductory substantive face-to-face (F2F) classroom experience</li> <li>▫ Subsequent independent online experiences</li> </ul>
<b>A.2 Replacement</b> <ul style="list-style-type: none"> <li>▫ Reduction of in-class meeting time</li> <li>▫ Replacement of face-to-face class time with online activities</li> <li>▫ Flexibility of online activities for computer lab or home</li> </ul>	<b>B.2 Flex</b> <ul style="list-style-type: none"> <li>▫ Instruction primarily online in a classroom with customized F2F support when needed</li> </ul>	<b>C.2 Bookend Blend</b> <ul style="list-style-type: none"> <li>▫ Introductory experience online or F2F</li> <li>▫ A substantive learning experience online or F2F</li> <li>▫ A conclusion that extends the learning into practice at work</li> </ul>
<b>A.3 Emporium</b> <ul style="list-style-type: none"> <li>▫ Elimination of class meetings</li> <li>▫ Substitution of a learning resource centre with online materials and on-demand personal assistance</li> </ul>	<b>B.3 Self-Blend</b> <ul style="list-style-type: none"> <li>▫ Option of an entirely online course to supplement traditional courses</li> </ul>	<b>C.3 Field Blend</b> <ul style="list-style-type: none"> <li>▫ A range of instructional assets</li> <li>▫ Choice of when and where to use the assets as needed to meet work-related challenges</li> <li>▫ Availability of online instructional assets</li> <li>▫ A possible classroom experience as part of the mix</li> </ul>
<b>A.4 Buffet</b> <ul style="list-style-type: none"> <li>▫ Several learning options from which students choose</li> </ul>	<b>B.4 Enriched Virtual</b> <ul style="list-style-type: none"> <li>▫ School experience mostly online with some on-campus enrichment</li> </ul>	

### 2.4.3 Advantages and challenges of blended learning courses

The literature on blended learning demonstrated advantages, challenges, and other considerations for learners and the teaching staff (King and Arnold, 2012).

#### Advantages of blended learning courses

There are many advantages in blended learning, such as the combination of synchronous and asynchronous teaching and learning (Vaughan, 2007; Ho et al., 2006). These advantages are related to the flexibility of time, accommodating various learning styles and responding to the needs of the students, and lower dropout rates (Ho et al., 2006). It is argued that students who have family or work related responsibilities, the flexible nature of blended learning accommodates their busy schedules (King and Arnold, 2012).

A community of inquiry in blended learning helps the students to collaborate with their peers and to foster social interaction and team learning, thus enhancing intellectual development. Due to the limited time for face to face interaction, supplementary modes of communication and collaboration can increase student motivation (Ho et al., 2006). For the teaching staff, the blended learning approach offers a high-quality teaching experience, higher-quality interaction between teachers and students compared to traditional face to face instructions, through flexible course design (Vaughan, 2007; Ho et al., 2006). Blended courses can provide an increased interaction between students and teachers through forum discussion, and emails, thus enhancing the quality of teaching and learning. According to Contact North (2014), blended learning has benefits for students, faculty, colleges and universities:

(i) Blended learning allows flexibility for students, who can have access to considerable components of their courses anywhere, anytime and often in any format (Contact North, 2014).

(ii) Blended learning facilitates student engagement. Students are self-directed during their free time. This allows students to get prepared and ready for face-to-face classes or tutorials. Furthermore, blended learning accommodates a large number of students, and offer effective learning experiences (Contact North, 2014).

(iii) Blended learning can be adapted to fit into existing teachers' roles and responsibilities. Blended learning provides a framework for teachers to use internet-based resources while it enables them to interact with students, both online and face to face (Contact North, 2014).

(iv) Blended learning enables teachers to facilitate online teaching at their own pace and in their own way. They realise how to balance between using resources online and offering face-to-face discussions for maximum student success. Continuous feedback from the students, assist the teachers to improve their teaching strategies (Contact North, 2014).

(v) Faculty members get to choose the approach to blended learning that reinforces their locus of control. They can adapt learning resources easily accessed online, design their own materials, design better in-class learning experiences. Ideas can be shared within a discipline or across disciplines and they “own” this work (Contact North, 2014).

(vi) For teaching establishments, blended learning is comparatively inexpensive. Technologically, blended learning leverages investments already made in learning

management systems through which teachers can incorporate the existing online resources and tools at slight or no charge (Contact North, 2014).

### **Challenges and barriers to blended learning**

Despite these advantages, potential challenges for learners and teachers are also documented in the literature. First, ICT literacy poses a major challenge to the learners usually in earlier weeks of the program. It is imperative for learners to have skills and accessibility to resources for a successful blended learning. Second, learners may lack interests and motivation to finish coursework (King and Arnold, 2012; Vaughan, 2007). The lack of motivation is related to challenges time management during the weeks the class does not meet in person (Holenko and Hoić-Božić, 2008). Learners with insufficient time management skills could rapidly fall behind on coursework. Lastly, learners in blended courses may have an irrational expectation that meeting less means less work (King and Arnold, 2012; Vaughan, 2007). Vaughan (2007) argues that a number of learners don't value face to face interaction with peers and teachers, but they view the time spent online as work, even if it is time they would have spent in class in a traditional course. Teachers are required to teach the students about the time management at the beginning of each course. Teachers' guidance and facilitation are pivotal for the success of blended learning (Ho et al., 2006).

When designing a blended learning program, the needs of the students must be balanced with the outcomes expected of the institution. Teachers, good as they may be in the traditional classroom, need further training so that implementation of the course is not hampered by a mismatch of content and technology. Finally, the teacher and the students need to understand the collaborative nature of the new learning endeavour so that a balance is struck and motivation to learn will remain. When learners are not given feedback, and reassurance it can cause frustration and lack of interests in self-directed learning (Dzakiria, 2012; King and Arnold, 2012). According to Contact North (2014) the unpreparedness of some students to use ICT hinder effective teaching and learning. Thus, a need to provide a proper orientation at the beginning of the program.

## **2.5 FACILITATION OF E-LEARNING IN EDUCATION**

### **2.5.1 Facilitation of teaching and learning**

Nursing education is the process whereby students are guided, assisted and provided with means which enable them to learn the art and science of nursing so that they can apply it to nursing care of people who need such care (Mellish et al., 1998 cited in Mangena and Chabeli, 2005; Santucci, 2004). To achieve this, nursing education needs to adopt facilitation methods based on identified methods (Lekalakala-Mokgele and du Randt, 2005). Literature indicates that there is recognition of the importance of facilitation for teaching and learning in higher education (Rienties et al., 2013; T̄iru, 2013; Sithole, 2011; Jarosinski and Heinrich, 2010; Osman and Herring, 2007; Thomas, 2004). Although facilitation is becoming popular, a number of obstacles have been reported by Sithole (2011), including: (i) Lecturers' lack of knowledge,; (ii) Use of teaching and assessment strategies that do not facilitate critical thinking in students; (iii) Negative attitudes of lecturers and their resistance to change; (iv) Inappropriate selection processes and poor educational background that did not facilitate critical thinking; (v) Inadequate socialisation; (vi) Cultural and instructional language incompetence. From the literature, it was found that facilitation is a way of teaching which embraces reflective dialogue leading to critical reflective learning (King and Arnold, 2012; Larrivee, 2008; Brockbank and McGill, 2007; Gray, 2007; Chenoweth, 1998; Reid, 1993).

Lekalakala-Mokgele and du Randt (2005) note that facilitation as a teaching and learning strategy was initially uncommon and innovative and presented a challenge to the students as it was a new way of learning. The authors argue that student support on this aspect is very important to prevent frustration amongst students, especially those that have never encountered a facilitation process. Different methods of support can be implemented such as scaffolding and mentoring. Off-campus contact with facilitators on a social basis can be organised to provide emotional support for the students (Lekalakala-Mokgele and du Randt, 2005). It is argued by Fry, Ketteridge and Marshall (2008) that teaching is often more about facilitation rather than providing subject expertise. The same authors stress the importance of letting the students tell their own stories or identify their own perspectives, and suggest that teachers should share their own enthusiasm and difficulties concerning the subject.

According to T̄iru (2013), there are three main types of facilitation styles at university level: the non-directive style of facilitation, the appreciative style and the practice-based style. In the

non-directive style of facilitation, the facilitator adopts an impartial attitude regarding the content and students' learning activities. The facilitator suggests, rather than planning when and how the student will act. The facilitator provides assurance in the activities to facilitate the self-development of the student, and encourages debates among the students. The facilitator also supports the students in personal self-knowledge and acceptance (Țîru, 2013). In the appreciative style of facilitation, the facilitator is centred on valorising the best characteristics the best practices of the students and offers permanent feedback for the students. The facilitator uses sustaining and encouraging phrases for the students and motivates them to improve in every moment. The facilitator also believes that what the student suggests is the best way of doing it (Țîru, 2013). In activity-based facilitation, the facilitator uses group work and is centred on group development. The facilitator determines the group to solve a given task in a predefined period of time, and she/he is also involved in team-work for facilitating the learning process. The facilitator sets up tasks which sustain the pragmatic character of the learning process (Țîru, 2013).

Tiru (2013) indicates that educators may adopt different facilitation styles depending on the students' year of study and the specificity of the educational activity. Similarly, McKimm and Jollie (2007) give three examples of how a teacher may play different sorts of roles depending on the size of the group and the type of technique and learning that is planned to take place: (i) In mass instruction techniques the teacher may use conventional lectures and expository lessons, lab classes, television and radio broadcasts, video, cable television, films. (ii) In individualised instruction, the teacher may use directed study (reading books, hand-outs, discovery learning), open learning, distance learning, programmed learning, mediated self-instruction, computer/web based learning, e-learning; one to one teaching and mentoring. (iii) In group learning the teacher might use the following: tutorials, seminars, group exercises and projects, games and simulations, role play, self-help groups, and discussions (McKimm and Jollie, 2007).

Facilitation, mentoring and coaching have been reported in various studies to be effective for teaching and learning (Park, Son and Kim, 2012; Kang, Yoo and Park, 2012; Myrick, Caplan, Smitten and Rusk, 2011; Cushion, Nelson, Armour, Lyle, Jones, Sandford et al., 2010; Gentry, Denton and Kurz, 2008; Murphy, Mahoney, Chen, Mendoza-Diaz and Yang, 2005; Jung and Tak, 2005; Wild, Shambaugh, Isberg and Kaul, 1999). This is in line with social constructivism or socio-cultural theory, in which individuals create or construct knowledge by attempting to

bring meaning to new information and to integrate this knowledge with their prior experience in their communication with others (Cushion et al., 2010; Murphy et al., 2005).

In regard to mentoring in education, this is a complex process because mentors have numerous roles. Possible roles for mentor include role model, advisor, guide, leader, friend, expert, supervisor, assessor and coach (Sykes, Urquhart and Foster, 2014; Botma, Hurter and Kotze, 2013; Hawkins and Fontenot, 2010; McKimm and Jollie, 2007). It is argued that mentorship is designed to socialise students into the nursing profession, promote their confidence, competence and foster their critical thinking ability (Myrick et al., 2011). Another concept used in the facilitation of learning is coaching. According to Perkins (1992), cited by Murphy et al. (2005), coaching based on the cognitive apprenticeship model should be used to guide learners in developing task management skills. Specifically, coaching involves providing motivational prompts, monitoring, and regulating learner performance, provoking reflection, and perturbing learners' models (Murphy et al., 2005).

### **2.5.2 Facilitation and e-learning**

Several studies have highlighted the importance of facilitation in online learning and teaching (Lehmann, Hähnlein and Ifenthaler, 2014; Coll, Rochera and de Gispert, 2014; Rienties et al., 2013; Popov et al., 2013; Kopp, Matteucci and Tomasetto, 2012; Kang et al., 2012; Myrick et al., 2011; An, Shin and Lim, 2009; Hew and Cheung, 2008; Osman and Herring, 2007). Instructors' abilities to teach online are critical in the quality of online education (Kim and Bonk, 2006). Kim and Bonk (2006) found that the most important skills for an online instructor during the next few years were how to moderate or facilitate learning and how to develop or plan for high-quality online courses. They found that over half of their survey respondents predicted that online collaboration, case-based learning, and problem-based learning (PBL) would be the preferred instructional methods for online instructors in the coming decade.

In many online (and indeed also classroom) groups, a small number of participants dominate while others make little or no contribution (Watts, 2010). Discussion boards and virtual classrooms do not necessarily lead to collaboration. Most academics have little experience of online teaching and learning and are unsure how to make the best use of these online tools. Putting the lecturers in the role of students helps them appreciate the potential of online learning (Watts, 2010; Lisewski and Joyce, 2003). The clearer the purpose of the online dialogue, the easier it is to craft the facilitation approach. Depending on the context, the e-facilitator might

be the convenor, online community owner or someone designated by the community owner or group (SDC, 2011). Instructor's facilitation has been considered an important indicator of teaching presence, strong enough to encourage students' participation in online discussions (Ladyshevsky, 2013; Baran and Correia, 2009). Consequently, a number of facilitation strategies have been identified that focus on the role of the instructor as a facilitator (Ladyshevsky, 2013).

Salmon (2004) developed a five-stage model to provide a framework to help experienced face-to-face tutors become e-moderators on Open University online courses in which their role was to support student engagement and learning in an entirely online course (Watts, 2010; Salmon, 2004): (i) **Stage one: Access and motivation.** The e-moderator makes sure that students can access the system and provides basic activities to help novices build their technical skills. This helps to increase their confidence in the new (both educational and technical) environment (Watts, 2010; Salmon, 2004). (ii) **Stage two: Online socialisation.** The e-moderator encourages the students to get to know each other online by exchanging messages and performing simple tasks together. This increases their confidence and forms the basis for collaborative work (Watts, 2010; Salmon, 2004). (iii) **Stage three: Information exchange.** The e-moderator helps the students to discover new knowledge and exchange information about it (Watts, 2010; Salmon, 2004). (iv) **Stage four: Knowledge construction.** The e-moderator encourages the students to evaluate resources and create their own content. The greatest amount of interactivity occurs at this stage (Watts, 2010; Salmon, 2004). (v) **Stage 5: Development.** The e-moderator encourages the students to reflect on and evaluate their own learning. The aim is for them to become self-directed, independent learners (Watts, 2010; Salmon, 2004).

Although the literature search indicated that studies have been conducted on the facilitation of e-learning in education, it was noted that many of the studies conducted on the use of e-learning or online platform in education focused on perceptions, attitudes and experiences of learners (Popov et al., 2014; Khee, Wei and Jamaluddin, 2014; Zhan and Mei, 2013; Yilmaz and Yurdugül, 2013; Roby, Ashe, Singh and Clark, 2013; Rendahl and Breuch, 2013; Lee, 2013; Ku, Tseng and Akarasriworn, 2013; Carter, 2013; Bloomfield and Jones, 2013; Smyth, Houghton, Cooney and Casey, 2012; Biasutti, 2011; Abdelaziz, Samer Kamel, Karam and Abdelrahman, 2011; Paechter, Maier and Macher, 2010; Koch, Andrew, Salamonson, Everett and Davidson, 2010). The focus is also on the experience and challenges of the educators in

using e-learning platform (Roby et al., 2013; Motaghian, Hassanzadeh and Moghadam, 2013; Regan, Evmenova, Baker, Jerome, Spencer, Lawson et al., 2012; Yengin, Karahoca and Karahoca, 2011; Hsieh and Cho, 2011; Cohen and Nachmias, 2011; Sun, Cheng and Finger, 2009; Liaw, Huang and Chen, 2007). Rienties, Brouwer and Lygo-Bake (2013) argue that the increased learning possibilities brought about by ICT are an important development in higher education, but many academics seem reluctant to embrace technology. Even though e-learning efforts are considered to be a significant corporate investment, the literature indicates high drop-out rates or failures (Motaghian et al., 2013; Ho, Minh and Hsieh, 2013; Penna, Stara and De Rose, 2009).

Online collaborative learning can cause frustration if not done effectively (Capdeferro and Romero, 2012; Tohm, 2012; Hara, 2000). A study by Capdeferro and Romero (2012) found that sources of frustration in online learning were related (a) to imbalance in the level of commitment, responsibility and effort, (b) to unshared goals and difficulties in organisation, (c) to difficulties in communication/dialogue in terms of frequency, (d) to problems with negotiation skills, (e) to imbalance in quality of individual contributions, (f) to excessive time spent and workload, (g) to conflict and problems in reaching consensus, (h) to imbalance between individual expected mark and group mark, (i) to misunderstandings, and (j) to lack of instructor's support/orientation. Providing quality of online participation has been one of the challenges because students may fail to engage in deep conversations and provide thoughtful and reflective contributions related to the discussion requirements (Baran and Correia, 2009). According to Lekalakala-Mokgele (2005), student support is very important on this aspect to prevent frustration, especially for those that have never encountered a facilitation process.

## **2.6 INTERNET RESOURCES**

The internet allows the user to get access to multiple types of the information stored on network servers, such as databases, electronic libraries, electronic journal articles and e-books, file archives, various web pages; and software (UNESCO, 2003). Nurse educators, students and nurses are challenged to close the nursing information digital divide by assuring nurses have the information literacy skills needed for evidence-based nursing practice (Miller, Graves, Jones and Sievert, 2010). However, professional databases are not usually nurses' first approach for finding and using information. Tanner, Pierce and Pravikoff (2003) assessed nurses' information literacy needs to determine readiness to practice from an evidence base.

The literature indicates several Metasearch engines for health care professionals such: MEDLINE (Medical Literature Online), Academic Search Premier, Nexus, CINAHL (Cumulative Index to Nursing and Allied Health Literature), Google and Google Scholar, ScienceDirect, ERIC (Educational Research Information Centre), Ebsco, Pubmed (Miller et al., 2010). Other metasearch engines used include: OmniMedicalSearch.com., MedNets, Hardin MD, Welch Medical Library, PDR.net., ClinicalTrials.gov., Intute., Healthline., HighWire Press., MedBioWorld., PubMed., MedConnect., Entrez. Hosted by NCBI, eMedicine, MedBioWorld, MedicalNDX, HONMedhunt, Antibiotic Guide, Electronic Orange Book, American Hospital Directory, PubGene, MedicalStudent.com, Journal Watch, MDLinx.com, Medscape (Nursingdegree.net, 2017). ACARM (2005) argues that it is necessary to carefully select information from some of the organisational domains, such as: (i) **.com:** Commercial sites, (ii) **.edu:** Educational institution, (iii) **.gov:** Government, (iv) **.org:** Non-profit organisations, (v) **.mil:** Military, (vi) **.net.**

When accessing online resources, it is important to be aware of copyright, and plagiarism policies. Copyright exists at the time of creation of a piece of work and represents the exclusive rights of the creator or owner to publish and sell his or her work such as books, art and music. Many students ignore copyright law, which then leads to plagiarism (Kader, 2007). According to Sandler (2000), plagiarism is a huge crisis at tertiary institutions in the USA which needs to be addressed. Plagiarism refers to the act of submitting someone else's work as though it were your own. Plagiarism also includes using parts of an original piece of work – even though it may have been amended – without permission or acknowledgement of the source (Kader, 2007).

## **2.7 INTERNET USE IN HEALTHCARE PROFESSIONS**

The internet is the world's leading network of information, communication and services. It is extensively used in medicine and has made a major impact in research, training and patient care (Trivedi and Joshi, 2008). Among healthcare professionals, knowledge about telemedicine, evidence-based medicine (EBM) and problem-based learning (PBL), good clinical practices, open access journals, Medline, Medscape, Cochrane reviews, e-medicine, MD-consult, ProQuest Medical Library (PML) etc., have to be assessed (Trivedi and Joshi, 2008). Use of the internet in healthcare professionals and their education is important to prepare

students to meet the demands of an increasingly technological world (Onwuegbuzie and Johnson, 2006).

According to MedPac (2004), IT allows healthcare providers to collect, store, retrieve, and transfer information electronically. However, more specific discussion of IT in healthcare is difficult due to lack of precise definitions, the volume of applications, and the rapid pace of change in technology. Healthcare professionals seek health information because they need to be updated on current developments in medical fields globally. They need to obtain answers to specific patient questions and they need information for teaching materials for undergraduates and postgraduates and for research (Trivedi and Joshi, 2008). From its inception, the internet has been a prime site for the dissemination of health information. It is used to access information, communication among care providers and patients (Brown, n.d; Sharma and Kaur, 2017; Fahy, Hardikar, Fox and Mackay, 2014). A study by Podichetty, Booher, Whitfield and Biscup (2006) on Internet use and effects among healthcare professionals found that the internet was used for professional updating, take web-based CME courses and providing information to the patients. In another study on the professional use of the internet among Saudi Arabian dermatologists conducted by AlGhamdi (2009), the internet was reported to be a useful tool for medical updating, obtaining information about medical courses, conferences, meetings, and for obtaining information on career (job) opportunities.

In a study by Rehman and Ramzy (2004), when respondents were asked to indicate their perceptions about the importance of using the internet in their work as healthcare professionals, almost two-thirds of them (65.4%) perceived the internet as extremely valuable, and more than one-third of them (29.9%) perceived it to be quite valuable. In the same study, it was found that majority of respondents learnt how to use the internet through self-instruction, and 60.6% reported that they used online help and documentation. Internet usage is widespread among physicians. However, use of online EBM resources such as the Cochrane Library, clinical evidence and up-to-date information was minimal (Trivedi and Joshi, 2008). Trivedi and Joshi (2008) found that most of the users in their survey were using PubMed (26.80%), indicating that the services provided by the internet were useful for their research work or dissertation purposes. However, in a study conducted in Iran by Asefeh and Asemi (2005), cited in Trivedi and Joshi (2008), Internet utilisation for research work purposes was 28%. According to Shim (2008), the internet has unquestionably changed the flow of health information. Due to the importance of the internet as a source of health information, people can now make themselves

well-informed and self-involved in health decision-making, based on simple Web searching (Fiksdal, Kumbamu, Jadhav, Cocos, Nelsen, Pathak et al., 2014; Suggs, 2006; Cassell, Jackson and Chevront, 1998). In the past, healthcare people tried to get help from printed materials such as books, journals, handbooks, monographs in personal libraries and from friends (Koller, Peltenburg, Joachim and Steurer, 2001; Thompson, 1997; Haug, 1997). However, increase in the pace of healthcare research and the introduction of computers and Internet has meant that many new electronic information resources and systems are now available (Sharma and Kaur, 2017; Trivedi and Joshi, 2008). Due to the easy availability of the internet there is an increased possibility of immediate access to the most recent and reliable results of clinical research in everyday medical practice in both developing countries and developed countries (Trivedi and Joshi, 2008). However, the Internet is still only available to a minority of healthcare professionals in developing countries like India and often it is not available when actually needed. There is a number of problems regarding its connectivity and speed (Trivedi and Joshi, 2008).

The degree of internet and IT use varies by healthcare setting: Pharmacies are generally advanced users, while other settings such as physician offices or nursing homes are further behind (MedPac, 2004). The Royal College of Nursing (2006) notes that today all nurses recognise the importance of evidence-based practice in which every care decision is informed by accurate and up-to-date knowledge. ICT, and in particular the internet, gives you the access you need to knowledge and resources including recent research findings, protocols and guidelines. From the literature, one would argue that the internet is gaining ground as the central source of health-related information (Kowalski, Kahana, Kuhr, Ansmann and Pfaff, 2014; Omolase, Balarabe and Omolase, 2010; Hesse, 2005; Cotten and Gupta, 2004; Baker, Wagner, Singer and Bundorf, 2003; Eysenback and Kohler, 2003; Doyle, 2002).

## **2.8 CONCLUSION**

This chapter covered the literature review on the utilisation of e-learning system in education and healthcare professionals. The following topics were discussed: the concept of e-learning; foundations of educational theory of e-learning; principles, guidelines, and benchmarks for online education; the Internet in education; existing typologies of Internet applications in education; ICT integration in the classrooms; blended learning in education; challenges and barriers to blended learning; facilitation of e-learning; and Internet use in healthcare professionals. The next chapter discusses the methodology that directed the study.

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

#### **3.1 INTRODUCTION**

This chapter explains the philosophical basis for the study approach. It describes the research approach and design, data collection and data analysis, ethical considerations and data management. It presents a blueprint of activities at the various phases of the action research.

#### **3.2 RESEARCH PARADIGM**

This study was guided by a pragmatic paradigm. The choice of this paradigm for the study was based on the fact that pragmatists link the choice of approach directly to the purpose of and the nature of the research questions posed (Creswell, 2003). The pragmatist paradigm is relevant to this study because it emphasises the link between action and truth, and the ultimate test of a belief is the willingness to act on it, as argued by Fendt and Kaminska-Labbé (2011). Pragmatism is not dedicated to any one system of philosophy and reality. It is ideal for this study as it advocates for mixed methods that are in line with action research approaches in order to provide the best understanding of a research problem. Pragmatists argue that research all the time takes place in historical, political, social, and other contexts. Thus, pragmatism provides an opportunity to use multiple methods, various worldviews and different assumptions, as well as different forms of data collection and analysis (Creswell, 2003).

#### **3.3 RESEARCH APPROACH AND RESEARCH DESIGN**

A participatory action research guided this study, using mixed methods (qualitative and quantitative), in order to analyse the utilisation of e-learning platform, and to develop a facilitation guide for nurse educators at a selected nursing school campuses in Rwanda. In their recent fourth edition, Denzin and Lincoln (2013) state that researchers have identified grounded theory as a useful qualitative method to adopt in mixed methods research. The rapid rise of mixed methods is a movement heralding a paradigm shift analogous to the qualitative research shift that Denzin and Lincoln started in 1994. Mixed methods in grounded theory take into account triangulation of the findings (Denzin and Lincoln, 2013), and Creswell and Plano Clark

(2007) argue that the qualitative method extends mixed methods practice, and may be given priority in mixed methods projects. For the purpose of this study, mixed methods and convergence parallel mixed methods were used (Creswell, 2007). This was used for various purposes, including collecting multiple data from numerous sources, analysing extensively the utilisation of e-learning in nursing education, corroborating findings, reducing investigator’s cultural biases, addressing participants experience, demonstrating credibility, increasing generalizability, and informing professional practice and/or public policy.

Due to the convergence parallel mixed methods used in this study, quantitative data are presented first, followed by qualitative data, based on the Strauss and Corbin (1990) framework of grounded theory, as the overall aim of this study is to develop a middle-range theory that would guide the utilisation of e-learning platforms in nursing education in Rwanda. The triangulation of both findings is done in Chapter 5 (Discussion of the results), with qualitative data dominating.

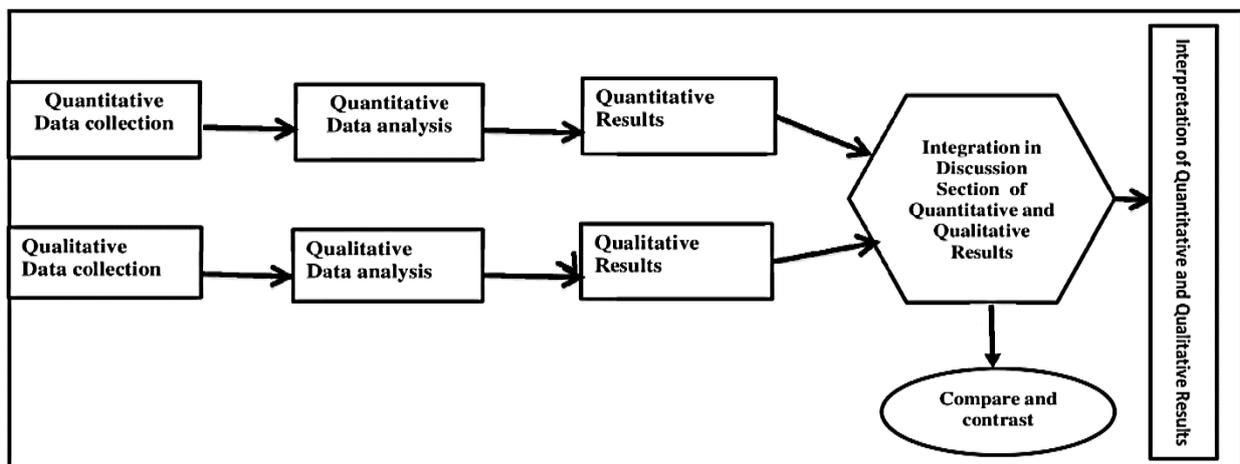


Figure 3-1: Convergence model of Mixed Methods adapted from Creswell (2007).

Participatory action research (PAR) is considered a subset of action research, which is the systematic collection and analysis of data for the purpose of taking action and making changes by generating practical knowledge (Gillis and Jackson, 2002). This study made use of action research in education and participatory action research. This is because it is regarded by several researchers as an attractive option for teacher researchers, school administrative staff and other stakeholders in the teaching and learning environment to consider (Hine, 2013; Mills, 2011). Specifically, action research in education can be defined as the process of studying a school situation to understand and improve the quality of the educative process (McTaggart, 1997 cited in Hine, 2013; Johnson, 2012). It also provides practitioners with new knowledge and

understanding about how to improve educational practices or resolve significant problems in classrooms and schools (Mills, 2011; Stringer, 2008).

### **3.4 OVERVIEW OF PARTICIPATORY ACTION RESEARCH**

In this study, participatory action research (PAR) was used. This is because participatory research is a social process – participatory, practical, collaborative, emancipatory, critical and reflexive; it explicitly explores the relationship between the realms of the individual and of social communities, and aims at transforming both theory and practice (Kemmis and McTaggart, 2007). The origins of PAR can be traced to the work of Kurt Lewin (1946), who is considered the founder of action research (Gillis and Jackson, 2002). Lewin also introduced the term ‘action research’ as a tactic in studying a social system while attempting to impart changes at the same time, and to emphasise the importance of client-orientated attempts at solving particular social problems (MacDonald, 2012; Gillis and Jackson, 2002). The roots of PAR can also be traced to Paulo Freire, who believed that critical reflection was crucial for personal and social change (MacDonald, 2012). The participatory action research approach of Freire was concerned with empowering the poor and marginalised members of society about issues pertaining to literacy, land reform analysis, and the community (Freire, 1970 cited in MacDonald, 2012).

Participatory action research is suited for research in a number of disciplines, such as education, health, community development, adult education, organisational development, agriculture, industry, university-community development, and research with groups of oppressed or marginalised individuals (MacDonald, 2012; McTaggart, 2006; Varcoe, 2006; Greenwood, Whyte and Harkavy, 1993). Participatory research has been comprehensively reviewed by a number of different authors, and it was reported that participatory action research leads to the generation of new ideas, theories, methods, or techniques; or the review, verification, adaptation or refining of existing ideas, theories, methods, or techniques through empirical studies (Nitsch, Waldherr, Denk, Griebler, Marent and Forster, 2013; Mackenzie, Tan, Hoverman and Baldwin, 2012; Andrews, Newman, Heath, Williams and Tingen, 2012; Liu, McCauley, Leung, Wang, Needleman and Pinto-Martin, 2011; Kemmis and McTaggart, 2007; Kindon, Pain and Kesby, 2007; Blackstock, Kelly and Horsey, 2007; Khanlou and Peter, 2005).

In education, action research can enhance the lives of those professionals who work within educational systems (Hine, 2013). Action research has been directly linked to the professional

growth and development of teachers (Hine, 2013; Hensen, 1996). According to Hensen (1996), action research (a) helps teachers develop new knowledge directly related to their classrooms; (b) promotes reflective teaching and thinking; (c) expands teachers' pedagogical repertoire; (d) puts teachers in charge of their craft; (e) reinforces the link between practice and student achievement; (f) fosters an openness toward new ideas and learning new things; and (g) gives teachers ownership of effective practices. Moreover, action research workshops can be used to replace traditional, ineffective teacher in-service training (Barone et al., 1996 cited in Hine, 2013), as a means for professional development activities (Johnson, 2012). In this study, collaboratively, the users of e-learning platforms analysed its use in selected nursing school campuses at the University of Rwanda and developed a middle-range theory to facilitate its implementation. This was useful because it allowed the users of e-learning platforms to identify problems, offer solutions to the identified problems and reflect on the effectiveness of the solutions, and it made the practitioners learn more about research in the process, thus enhancing transferable skills.

### **3.5 PRINCIPLES OF PARTICIPATORY ACTION RESEARCH**

Although development and definitions of PAR vary, common principles and characteristics of PAR can be identified (MacDonald, 2012). The literature notes a number of principles or characteristics of action research: Action research process is cyclical and spiral (Dick, 2009:3; IDEAS for Action Research, 2002:2); action research is collaborative and participative (Mitchell, Reilly and Logue, 2009; IDEAS for Action Research, 2002; O'Brien, 2001:3); action research accommodates mixed methods; action research is reflective (Dick, 2009:3; McNiff, 2009:5; IDEAS for Action Research, 2002:2); action research solves practical problems and leads to change in practice (Dick, 2009; McNiff, 2009; Holter and Schwartz-Barcott, 1993), Development of Theory (McNiff, 2009; Holter and Schwartz-Barcott, 1993). The following principles guided this study:

#### **Principle 1: Action research process is cyclical/spiral**

This study was executed in four major cycles: planning, action, observation and reflection. Each phase consisted of identification of the activity for that stage, planning how to go about the activity, executing the activity, collecting/analysing data, and reflecting on the information and what was done. For this reason, the cyclical/spiral was applied (Dick, 2009:3; IDEAS for Action Research, 2002:2).

**Principle 2: Action research is collaborative and participative**

In this study, the roles of the researcher and co-researchers were those of facilitators, supporters and co-learners. There was no researcher or co-researcher monopoly at any of the sessions. The whole process was democratic, fair and just. The participants made critical inquiry into the major issues of concern in their own practice, with a constructive sense of ownership, responsibility and accountability. Each person's ideas were equally significant as potential resources for creating interpretive categories of analysis, and were negotiated among the participants (Mitchell et al., 2009; IDEAS for Action Research, 2002; O'Brien, 2001:3).

**Principle 3: Action research accommodates mixed methods**

In this study, some of the data were qualitative, collected through in-depth interviews, focus group discussions, observation and open-ended questionnaire, and some were quantitative, collected using a structured questionnaire. The type of mixed methods applied in this study was a convergence model of mixed methods also known as triangulation design (Dick, 2009:3; McNiff, 2009:5; IDEAS for Action Research, 2002:2).

**Principle 4: Action research is reflective**

In this study, the researcher and co-researcher team and the participants undertook the critical reflection process together at each phase as part of their learning/professional development process. The reflection at each phase led to the next set of actions in the succeeding phase, directed towards promoting the use of e-learning systems in nursing education in selected schools in Rwanda. Participants reflected on issues and processes and made explicit the interpretations, biases, assumptions and concerns upon which judgments were made, thus respecting the reflective principle (Dick, 2009:3; McNiff, 2009:5; IDEAS for Action Research, 2002:2).

**Principle 5: Action research solves practical problems and leads to change in practice**

In this study, desire for change was the key motivating force that led the researcher to look at this area of practice. The scope of the study was therefore limited to the aspect of utilisation of the e-learning platform in nursing education. Thereafter, the middle-range theory was developed to facilitate the implementation of an e-learning platform at selected school campuses. This was in line with various authors who argue that action research solves practical

problems and leads to change in practice (Dick, 2009; McNiff, 2009; Holter and Schwartz-Barcott, 1993).

### **Principle 6: Development of Theory**

In this study, the research team worked through various stages of the research process and analysed the use of e-learning platforms, and based on the study findings and on various studies reported in the literature the team developed a middle-range theory. The outcome of this study was to develop a middle-range theory to guide or to serve as a framework in effective utilisation of the e-learning platform in nursing schools in Rwanda. This was in line with a number of authors who indicated that action research leads to the development of theory (McNiff, 2009; Holter and Schwartz-Barcott, 1993).

## **3.6 INCORPORATING GROUNDED THEORY IN ACTION RESEARCH**

In this study, grounded theory was incorporated in action research. This section provides a brief description of the grounded theory and its integration in action research.

### **3.6.1 Grounded theory**

Grounded theory was originally developed by Barney Glaser and Anselm Strauss in 1967. Grounded theory methods refer to systematic, yet flexible procedures for collecting and analysing qualitative data in order to generate theories grounded in the data' (Charmaz 2006). The goal of grounded theory is to take qualitative studies beyond mere description to create explanatory theoretical frameworks (Charmaz 2006), using a rigorous inductive approach to generate theory from the real-world context. Grounded theory is based on an iterative study design that encompasses concurrent collection and analysis of data, where the latter informs the next cycle of data collection. Grounded theory involves theoretical sampling in which participants or data sources are purposefully selected on theoretical grounds for their ability to ratify or refute the emerging theory (Lingard, Mathieu and Levinson, 2008; Corbin and Strauss, 1990). Central to grounded theory is a systematic data analysis process which involves a three-step coding procedure conducted iteratively, using constant comparison aimed at continually refining the emerging construct with new data (Charmaz 2006; Strauss and Corbin, 1990).

During the past decade, the form of grounded theory has evolved, as Glaser and Strauss took divergent directions from their classic discovery of 1967. The classic version of grounded theory, which Glaser ascribes to, emphasises constant comparative method which narrows the theoretical sampling so that it becomes event-oriented rather than participant-oriented (Baskerville and Pries-Heje, 1999), with an equivocal etymological undertone that resonates with quantitative methods (Charmaz 2006). Being inspired by the writings of interactionists and pragmatists such as Dewey, Mead, etc., Strauss saw people as active agents in their lives and worlds rather than as passive recipients of larger societal forces, and he believed that subjective and social meanings relied on the use of language and emerged through action (Charmaz 2006). Strauss considered grounded theory methods as symbolic interactionism with the need to go to the field or the environment to understand what is actually going on, to understand the importance of theory generated in reality to its discipline, to understand the complex nature of experience and the role of people as they actively participate in determining their worlds, and to understand the interrelationships among conditions, meanings and actions (Strauss and Corbin, 1990).

Strauss and Corbin proposed an analytic procedure that has gained popularity among users, and moved the grounded theory methods towards verification. Rather than giving emphasis to the comparative method, the coding process is more rigorous in this version and categories emerge from concepts (Charmaz 2006; Baskerville and Pries-Heje, 1999; Corbin and Strauss, 1990). Nevertheless, Glaser continues to maintain his original thoughts about grounded theory as a method of discovery and contends that Strauss and Corbin's version of grounded theory forces data and analysis into preconceived categories, which totally goes against the primary canons that the classic grounded theory upheld (Glaser, 1992).

### **3.6.2 Grounded action research**

According to Simmons and Gregory (2003), grounded action research is an extension of grounded theory from generating theories to designing and implementing practical models and actions aimed at social change. Baskerville and Pries-Heje (1999) define grounded action research as an integration of grounded theory methods in an action research inquiry for the purpose of studying and tackling the complexities of organisational and societal problems and for theory generation.

The difference between grounded theory and action research is that grounded theory is a method in itself, whereas action research remains open with no specific methodological procedure (Campbell and Groundwater-Smith, 2010; Carr, 2007; Carr, 2006).

The literature indicates that grounded theory methods in action research establish rigour and ground the theories in data, experience or action, because action research does not provide pre-defined methods of how to develop a theory (Dick, 2007; Kock, 2004). The use of grounded theory methods in an action research study design helps improve research rigour, because it addresses the validity threats of action research and because the generated theory is grounded in the data and the action (Kock, 2004). The grounded theory puts the researcher in the position of a scientist who can make sense of and theorise the data or the participants' stories; although participants do not take part in the data analysis process, the researcher in action research is part of the context, assuming an insider-outsider stance (Poonamallee, 2009). Unlike grounded theory, action research is participatory. In the analysis, the researcher may conduct slicing of the data but the meanings from the analysis are somehow negotiated with the participants (Freeman, 1996).

In this study, the combination of action research and grounded theory was useful in enabling the study to capitalise on the strengths of the action iterative orientation of action research and the rigorous theory-building techniques of grounded theory. Qualitative data were analysed using grounded theory in all action research cycles of this study. Integration of grounded theory in action research has been effectively applied by a number of researchers (Poonamallee, 2009; Greenall, 2006; Kock, 2004; Simmons and Gregory, 2003; Baskerville and Pries-Heje, 1999). In theory development, the use of grounded theory methods in action research studies holds promise because rigour is established and theories are developed for social change. Researchers have used either the Straussian grounded theory (Kock, 2004; Baskerville and Pries-Heje, 1999) or the Glaserian grounded theory (Dick, 2007; Simmons and Gregory, 2003) with action research. Grounded theory is concerned with the development of a theory that is grounded in data, and grounded action uses the data to develop actions to support it (Simmons and Gregory, 2003). Grounded theory in this study provided a framework for generating the theory, whilst action research provided a foothold for planning and implementation of actions.

### **3.6.3 Theoretical sampling in grounded theory**

The key aspect of grounded theory in determining the emergent theory is the theoretical sampling and theoretical saturation (Goulding, 1999; Munhall, 1995; Strauss and Corbin, 1990; Chentiz and Swanson, 1986; Glaser and Strauss, 1967). According to Strauss and Corbin (1990), theoretical sampling involves sampling on the basis of concepts that have proven theoretical relevance to the emerging theory. It entails a focused data collection of determined data (Charmaz 2006), and it is the sampling of incidents rather than of people. Theoretical sampling focuses the process of further data collection to refine the emerging categories. It requires negotiating and balancing the involvement and distance from the field (Charmaz 2006).

In this study, for qualitative data collection in all cycles, theoretical sampling was based not on the number of participants, but rather on the theoretical concepts that emerged from the repeated sessions with the same participants over time at the respective research settings. The sample size was thus not predetermined at the beginning of the study, but emergent on the theoretical concepts saturation, and was an iterative process founded on the data collection and simultaneous data analysis (Strauss and Corbin, 1990). Theoretical sampling involves open sampling done in open coding, relational and variation sampling in axial coding, and discriminate sampling for selective coding (Corbin and Strauss, 1990).

#### **3.6.3.1 Open Sampling**

According to Strauss and Corbin (1990), open sampling is connected to open coding, and involves the openness in sampling choices. The openness in this form of sampling afforded the opportunity for being open to all possibilities for potentially relevant concepts to emerge. In, the initial cycle of this study, open sampling was conducted and participants were purposively recruited based on the following criteria: The participants were involved in e-learning in the selected school, some as nurse educators, nursing students, ICT manager and campus manager, plus key informants from the selected nursing school, who were willing to participate in this study. Open sampling proceeded concurrently with data collection and analysis, as the researcher and the research team developed more questions about the data collected. All participants formed part of the sample.

### 3.6.3.2 Relational and Variation Sampling

According to Strauss and Corbin (1990), relational and variation sampling focuses on uncovering and validating relationships between the conditions/antecedents, context, action interactions and consequences. In this study, this was done to densify categories using comparison and questions, and guided the decisions taken by the team about what, who and when to sample. Through selective coding in the last cycle, sampling became more deliberate and focused, because the aim of selective was to integrate the categories to form a theory. Strauss and Corbin (1990) label this as a discriminate sampling, because sampling choices are made to maximise the chances of verifying the storyline, to maximise relationships and to build poorly developed categories. At this stage, the researcher consulted with key informants and documents until theoretical saturation of all the categories was achieved (Corbin and Strauss, 1990).

In this study, relational and variation sampling was adopted in cycles three and four, as the researcher and the team needed to demarcate and refine the emergent categories in using the paradigm model. In this study, identifying the participants was purposefully done, based on their ability to give data that had theoretical relevance and could verify, densify or refute the emerging categories.

## 3.7 ESTABLISHMENT OF THE RESEARCH TEAM

Central to PAR is collaboration (Bergold and Thomas, 2012). In education, academics work better on issues that they have discovered for themselves and they turn out to be effective when exhilarated to assess their own work and then reflect about future improvement. They help each other by working collaboratively. Working with peers facilitates educators in their career development (Ferrance, 2000). These considerations made it very important to form a research team to be involved in this study.

In this study, the research team consisted of participants with expertise and experience in nursing education and ICT, in line with the interactive/mutual collaborative action form of research. The research team included nurse educators, ICT managers, and experts in e-learning and education. They came from the selected nursing school campuses in Rwanda, and had in particular been facilitating the nursing students via an e-learning platform.

A recruitment/selection strategy was used to elicit interest from the highest possible number of potential members, while maximising the possibility for the long-term commitment of team members. Nurse educators and ICT managers were invited to participate in project orientation sessions in which the project was explained in more detail, and explicit benefits and requirements of becoming team members were discussed so that attendees could decide if they were willing and able to participate at the level required for the action research. A number of issues were clarified for all potential research team members.

After the initial session, these individuals then participated in individual interviews during which further questions were clarified, and individual concerns and needs were addressed. Once the team members had been identified, they were informed about working with the researcher over the course of the study from the planning stage to the development of the middle-range theory for using an e-learning platform in nursing education. This was because they were the ones who were going to use the newly designed middle-range theory for its future sustainability. One of the inclusion criteria was to have had experience of at least six months of teaching in a selected nursing school. It also included people working at the selected campuses at UR who were interested in this research. Initially, six individuals were part of the research team (two from each campus: one nurse educator and one ICT manager), and later the selected school suggested adding experts in e-learning/ distance learning and education who were working collaboratively with nursing school. The various roles and responsibilities of team members were clarified on an on-going basis. Emphasis was put on the equal value of all individual roles, taking account of the differing contributions made by each team member. All team members were considered to be offering expertise.

As indicated by Paris, Salas and Cannon-Bowers (2000), a research team should have characteristics to distinguish it from simply being a small group. In this study, the research team had the following characteristics: multiple sources of information, task interdependencies, coordination among members, common and valued goals, specialised member roles and responsibilities, task-relevant knowledge, intensive communication, and adaptive strategies to help respond to change.

### **3.8 TRAINING OF THE RESEARCH TEAM MEMBERS**

Following the principle that participatory action research provides practitioners with new knowledge and understanding about how to improve educational practices or resolve significant problems in classrooms and schools (Mills, 2011; Stringer, 2008), and inspired by a participatory action research pilot study conducted by Brown, Hernández, Saint-Jean, Evans, Tafari, Brewster, et al. (2008) in which team members were trained on various topics, this study began with a series of training events for the research team members. The researcher, once ethical clearance from UKZN and Ministry of Education had been obtained, facilitated on-going training for all team members which was fundamental to the research project. Members made informed decisions that impacted the quality of the research outcome. The responsibilities of each team members were outlined and a two-day training session for the was conducted research team at each campus following the programme indicated below.

#### **Day 1 of training:**

- Reviewed the purpose and process of the participatory action research
- Reviewed the study focus on the utilisation of e-learning platform in nursing campuses
- Discussion about the role and involvement of the research team in the study
- Discussion about data collection methods to be used in this study
- Discussion about the inductive approach to identify emergent concepts. For example, issues that arise through study, rather than those defined in advance
- Conducted a field note exercise on the facilitation of e-learning by nurse educators, and stressed the importance of being descriptive and not interpretive. Proper note taking was explained.

#### **Day 2 of training:**

- Discussion about the research instruments (questionnaires and interview guide), and revised them where necessary.
- Interview training: techniques to elicit discursive answers; recognising and dealing with obstacles during the interview process.
- Discussion about protection of the research participants and research ethics
- Discussion about data management during and after the study
- Discussion about potential challenges that may hinder the good running of the study.

- Plan for the way forward and the schedule of meetings.

The research team made a significant contribution to the study. Its role included participation in planning the course of the project, data collection and analysis, reflective sessions, making meaning of the findings and dissemination of findings. The team was also instrumental in arranging the events during the study. This involved setting up meetings with stakeholders and the training seminar on the use of Moodle, taking action as and when issues emerging from the themes of the study needed a response, and a follow-up of the positive changes among nurse educators. The experts in e-learning/distance learning and nursing education and the campus manager of the selected campus gave access to the researcher to analyse Moodle as the learning management system being used. The information gathered in collaboration with the experts from the selected school had key significance for the study. Some research team members took initiatives to communicate with experts when they encountered difficulties relating to the use of Moodle. The team members and the researcher continued to share information on e-learning via e-mails and the Moodle platform, which added further value to the findings that were initially collected.

### **3.9 RESEARCH CYCLES**

This study used participatory action research in four cycles:

- Cycle one: Needs analysis through exploration of the current use of e-learning platform
- Cycle two: Designing an intervention plan based on the identified needs
- Cycle three: Pilot testing and evaluation of the intervention plan
- Cycle four: Development of the middle-range model for utilisation of e-learning platform

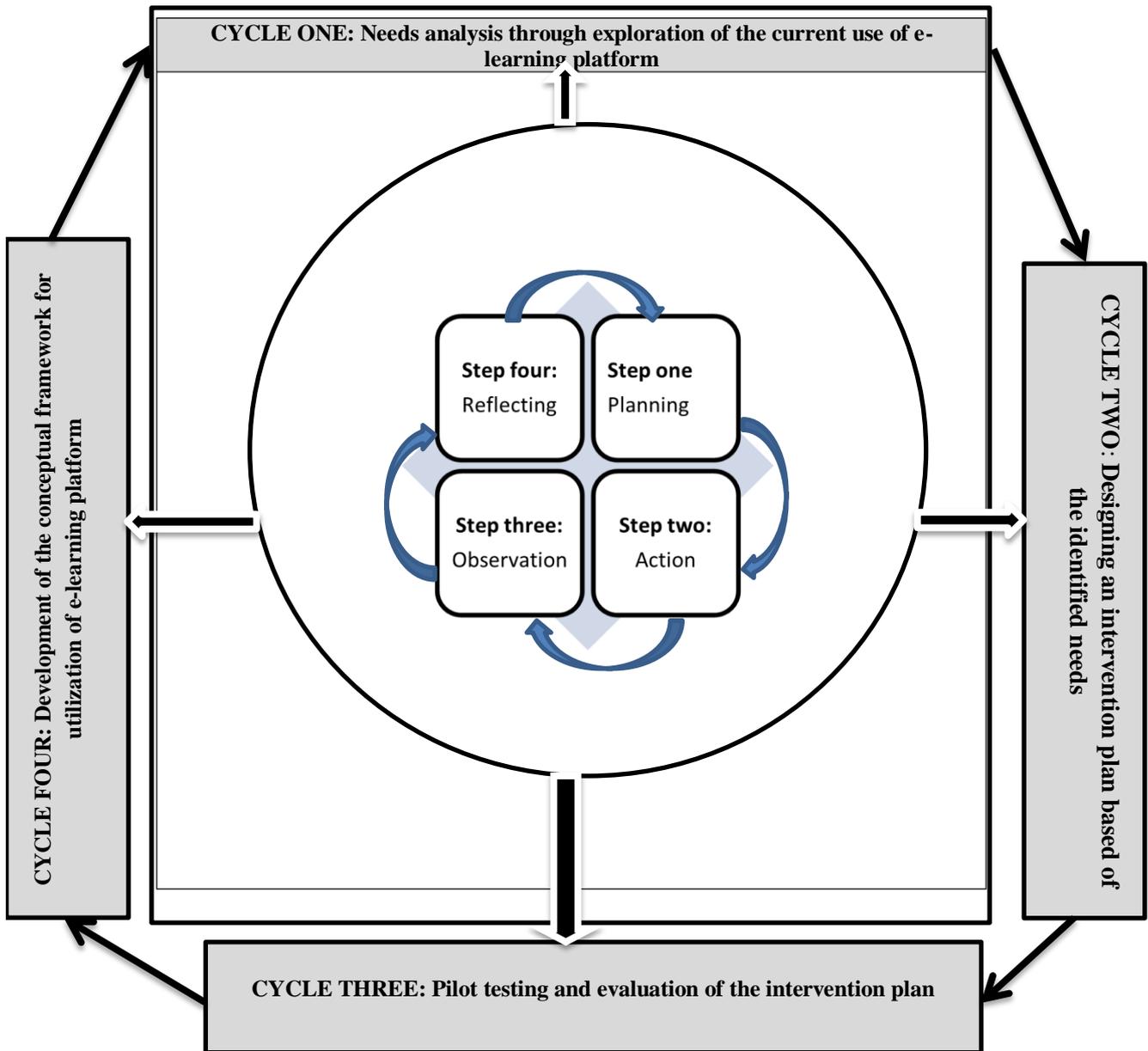


Figure 3-2: Conceptual framework of action research adapted from Lewin's model (Lewin, 1946).

Each of the four research cycles responded to a set of factors specific to that cycle relating to research questions, research setting, participants and sampling methods, research instruments, data collection process and data analysis.

### 3.9.1 Cycle one: Needs analysis through exploration of the current use of an e-learning platform

Cycle one explored the current use of an e-learning system in selected nursing and midwifery campuses. According to McCawley (2009), a need assessment is a systematic approach to

studying the state of knowledge, ability, interest and attitudes of a defined audience or group involving a particular subject. A needs assessment has also been defined as a systemic effort to determine the nature of problems, challenges and opportunities in a specific area, and as a systemic set of procedures undertaken for the purposes of setting priorities and making decisions about a program or organisational improvement and allocation of resources (Spector and Yuen, 2016).

In this cycle, the research team highlighted the nature of problems, challenges and opportunities related to the utilisation of e-learning set priorities, which were then used in turn in the second cycle of planning and designing the intervention.

The specific research questions for cycle one were:

- How is the e-learning platform currently utilised at the selected nursing school campuses in Rwanda?
- How do nurse educators facilitate the e-learning at the selected nursing school campuses?
- How do students use the e-learning platform at the selected nursing school campuses?
- How are the users of the e-learning platform supported at the selected nursing school campuses?
- What intervening conditions facilitate or hinder the use of the e-learning platform at the selected nursing school campuses?

#### 3.9.1.1 Research design

In cycle one a mixed methods design was adopted, following a convergence mixed model in which both qualitative and quantitative approaches were used to explore the use of an e-learning platform at selected nursing campuses. It is argued that mixed methods can help to ensure better transferability of the action research study results to other contexts and community settings (Ivankova, n.d; Angell and Townsend, 2011; Curry, Nembhard and Bradley, 2009; Creswell and Clark, 2007). Mixed methods refer to the use of two or more quantitative and/or qualitative strategies within a single research project (Onwuegbuzie and Johnson, 2006). Mixed methods are exemplified when a single study uses multiple or mixed strategies to answer the research questions and/or test hypotheses. Use of mixed methods research design is a growing tendency in the health sciences (Twinn, 2003).

According to Creswell and Clark (2007), a mixed methods approach refers to the inquiry in which the researcher links in some way both quantitative and qualitative data in order to offer a unified comprehension of a research problem. Quantitative research has traditionally provided a measurement orientation in which data can be gathered from many individuals and trends assessed across large geographic regions (Creswell and Garrett, 2008). Qualitative research, on the other hand, yields detailed information reported in the voices of participants and contextualised in the settings in which they provide experiences and the meanings of their experiences (Creswell and Clark, 2007). There are five main purposes for using mixed methods when studying a phenomenon of interest. These include triangulation, complementarity, development, initiation and expansion (Creswell and Clark, 2007). Triangulation refers to the junction or corroboration of data gathered and various interpretations about the same phenomenon, although the exact approach or form of data gathering and/or interpretation can vary (Creswell and Clark, 2007). Complementarity is attained, beyond triangulation, by focusing not only on overlapping or combining data but also on the different facets of the phenomenon, thus providing a greater range of insights and perspectives (Creswell and Clark, 2007). The development combines or uses, the findings from one method of studying a phenomenon to develop another method. For example, workshops are sometimes used to gain feedback on what have been done (Creswell and Clark, 2007). Initiation involves the intentional analysis of new perspectives on a phenomenon of interest (Creswell and Clark, 2007). The expansion is the overall widening of the scope, breadth or range of a study (Creswell and Clark, 2007).

In this study, the convergence model of mixed methods, also known as triangulation design, adopted from Creswell (2007) was used in this cycle, which represents the traditional model of a mixed methods triangulation design (Creswell, 1999) cited by Creswell and Plano Clark (2007). In this model, the researcher collects and analyses quantitative and qualitative data separately on the same phenomenon and the different results are then converged (by comparing and contrasting the different results) during the interpretation. Researchers use this model when they want to compare results or to validate, confirm or corroborate quantitative results with qualitative findings. The objective in this model is to end up with valid and well-substantiated conclusions about a single phenomenon (Creswell, 2007). This model was used to simultaneously collect both quantitative and qualitative findings on the utilisation of e-learning platform from the participants at the selected nursing school in Rwanda (Figure 3-2).



is a concurrent process of multi-methods research, and taking action as a result of on-going findings. In this way, teachers come to own both their knowledge and their practice (Pine, 2009).

In cycle one of this study, the population comprised 77 nurse educators, 3 campus managers, 317 students (enrolled in second and third years) and 3 ICT managers. All the participants were from the three selected campuses. The distribution of the population according to campuses was as follows:

- At campus A: the population consisted of 118 students, 27 nurse educators, 1 ICT manager, and 1 campus manager.
- At campus B: the population consisted of 98 students, 25 nurse educators, 1 ICT manager and 1 campus manager
- At campus C: the population consisted of 101 students, 25 nurse educators, 1 ICT manager, and 1 campus manager.

**Table 3-1: Summary of the population distribution, categories per campus and sample size**

<b>Campuses</b>	<b>Category of the population</b>	<b>Population</b>	<b>Sample size (with confidence level of 95%)</b>
<b>Campus A</b>	Nursing students	118	91
	Nurse educators	27	27
	ICT manager	1	1
	Campus manager	1	1
<b>Total campus A</b>		<b>147</b>	<b>120</b>
<b>Campus B</b>	Nursing students	98	79
	Nurse educators	25	25
	ICT	1	1
	Campus manager	1	1
<b>Total (campus B)</b>		<b>125</b>	<b>106</b>
<b>Campus C</b>	Nursing students	101	81
	Nurse educators	25	25
	ICT	1	1
	Campus manager	1	1
<b>Total campus C</b>		<b>128</b>	<b>108</b>
<b>Total for 3 Campuses</b>		<b>400</b>	<b>334</b>

As indicated in Table 3-1 the total sample size of participants considered was 334 (77 nurse educators, 251 nursing students, 3 ICT managers, and 3 managers of campuses).

Due to the nature of mixed methods used in this study, in cycle one of needs analysis, three sampling methods were used: stratified and simple random sampling for quantitative data, and purposive sampling for qualitative data. In the quantitative data collection, stratified sampling according to the population of each campus was used based on Rasoft sample size calculator, followed by simple random sampling to select the participants from each campus. According to Wiśniewska (2011), for mixed methods studies the size of population investigated in the quantitative part is much bigger than the population needed for the qualitative part. The sample size for the quantitative phase in cycle one of this study is shown in Table 3-1. Table 3-2 shows the population for each campus, sample size based on 95% confidence interval, the number of participants who participated, and the response rate.

**Table 3-2: Summary of population per campus, sample size and response rate**

<b>Campus</b>	<b>Population</b>	<b>Sample size</b>	<b>Number of those who participated</b>	<b>Response rate</b>	<b>Total response rate</b>
<b>Nursing students</b>					
Campus A	118	91	87	95.6%	<b>90.4%</b>
Campus B	98	79	72	91.1%	
Campus C	101	81	68	83.9%	
<b>Teachers</b>					
Campus A	27	27	24	88.8%	<b>57.1%</b>
Campus B	25	25	16	64%	
Campus C	25	25	4	16%	
<b>ICT managers</b>					
Campus A	1	1	0	75	<b>75%</b>
Campus B	1	1	1	100%	
Campus C	1	1	1	100%	
<b>Campus managers</b>					
Campus A	1	1	0	75%	<b>75%</b>
Campus B	1	1	1	100%	
Campus C	1	1	1	100%	

**For the qualitative phase**, a non-probability, purposive sampling was applied by the researcher, based on individuals who would provide useful information to the study. Forty participants were involved in the qualitative data collection: 18 nurse educators, 17 nursing students, two ICT managers (coded as teachers for anonymity because there were only two), and three participants who formed a focus group of experts in the fields, who were recommended by the selected nursing school. Theoretical sampling and data saturation guided the final number of participants.

#### 3.9.1.4 Inclusion criteria

In the cycle one, for data collection the following criteria were considered in selecting nurse educators, students, ICT managers and managers of campuses to be involved in this study: (i) Have had at least six months of experience working in public or private nursing and midwifery campuses in Rwanda; (ii) Be employed as nurse educators in the selected nursing campuses at the time of data collection; (iii) Be involved on a daily basis with the nursing and midwifery students; (iv) Be willing to participate.

For the students, the criteria to be involved in this study were: (i) Have had at least one year of using e-learning platform for their learning purposes in selected campuses of nursing and midwifery; (ii) Be registered in the selected nursing campuses at the time of data collection, (iii) Be willing to participate.

#### 3.9.1.5 Research instrument and data collection process

The data in mixed methods studies come from questionnaires of different types and from interviews with research participants (Wiśniewska, 2011). A variety of methods is used for data collection, including a structured questionnaire, an in-depth interview guide, and written descriptions of specific experiences in diaries or journals and observations (Grills and Jackson, 2001). Finnemore (2001), cited in Wilson and Clissett (2010), lists various tools that can be used to capture inter-subjective meanings: discourse analysis, process tracing, genealogy, structure focused comprehension, interviews, participant observation and content analysis. This study used structured questionnaires, in-depth interviews, focus groups, field note and research journals, analysis of Moodle platform, and the curriculum and policies for the e-learning platform.

Cycle one of the present study explored the use of e-learning system by nurse educators, students, ICT managers and managers of campuses from all three selected nursing campuses. A mixed methods approach was used for data collection. For quantitative data collection, structured questionnaires were used (Annexures 3, 4, 6, 8). These questionnaires were developed following the adjustment of the research tools on ICT in education from European Union (2013), Harerimana (2013); Kheswa (2010), Kripanont (2007), and Schlosser and Pirolli (1998). Furthermore, the choice of the questions was guided by the research objectives, research questions, concepts and theories underpinning the use of ICT in education, and empirical literature review.

Qualitative data was also collected to investigate the perceptions and the lived experiences of nurse educators, ICT managers and students on using the e-learning system at their selected nursing campuses. Qualitative data was collected using in-depth interviews with nurse educators, nursing students and ICT managers (Annexure 5, 7, 9). Thirty-seven participants were considered for in-depth interviews, based on data saturation, and three participants for

one focus group with experts in the fields, who were recommended by the selected nursing school.

Permission for the research was obtained from the Ministry of Education, the principal of the College of Medicine and Health Sciences-UR, the dean of the school of Nursing and Midwifery, from the campus managers, and from nurse educators, ICT managers and nursing students who were involved in this study. All the participants were approached on their campuses, or in the areas where they were participating in academic-related activities (clinical settings for students) and at the National Council for Nurses and Midwives (NCNM) during the marking of the licensing examination, and the purposes of the study were fully explained.

Once all those who agreed to participate had been identified, a date for data collection was identified. For nurse educators and ICT managers, the staff rooms in each campus were used as the venues for data collection during the break and lunch time. The NCNM offered a room for interviews and for nurse educators. The interviews for nursing students were conducted at their respective campuses, in a quiet room that had been made available, and in the case of a few nursing students who were on clinical placements, the unit managers offered a room in where the interview could be conducted free of disturbances.

The managers of campuses were approached in their respective offices. Respondents were provided with a study information sheet and the consent form to sign. Respondents were informed that the questionnaire was anonymous and that no identifiable information should be entered on it. The research team members distributed the questionnaires. Participants completed the questionnaires on their own to ensure confidentiality and anonymity. The completed questionnaires were collected and placed in a box for security reasons. Codes and numbers were used instead of participants' names to ensure confidentiality, as recommended by Burns and Grove (2003). The interviews were conducted by the researcher and were audio-recorded in a quiet and confidential place. The duration for the interviews was 20 to 40 minutes, with the interviewer using open-ended questions that participants were encouraged to discuss, and 40 minutes for the focus group discussions.

#### 3.9.1.6 Data analysis

The quantitative data was analysed using SPSS 23. Descriptive statistics were used to describe the characteristics of the research participants and their quantitative responses. Averages and

percentages were used to portray the data from the study, and Spearman and Pearson's correlations were used to establish the relationship between various constructs related to the study. The qualitative data collected was analysed simultaneously and the mass of words generated by interviews or observational data were described and summarised as recommended by Lacey and Luff (2001). All interviews were audio-taped and transcribed, except for a few respondents who refused to be audio-recorded; their views and experiences were written as they were being interviewed. The researcher and the research team read all the transcripts and field notes for overall understanding and immersion in the data to comprehend its meaning in its entirety (Bradley, Curry and Devers, 2007; DiCicco-Bloom and Crabtree, 2006). Reviewing data without coding helps in identifying emergent themes without losing the connections between concepts and their context (Bradley et al., 2007). Transcriptions of the interviews were analysed using the constant comparative method (Heath and Cowley, 2004; Strauss and Corbin, 1990). Data analysis was iterative with data collection. Data were analysed as they were being collected through the process of coding. Through open coding, common themes of everyday life were identified and examined in relation to the context, meanings, and the utilisation of e-learning platform in selected nursing campuses. Interviews were coded by conceptualising underlying patterns in the data. Initial data analysis guided further data collection, leading to further conceptualisation of the data and refinement of the coding schemes. Conceptual saturation was reached when no new categories were generated. Through the process of open coding, memos were written throughout the coding process to track conceptual decisions and ideas as they were occurring. Theoretical memos also were coded using theoretical coding and served as the basis for writing the middle-range theory during the final phase of the analysis.

Credibility of the data was established using the techniques of persistent observation (recurring observations of the research participants during and between individual and focus group interviews), peer debriefing (presenting analyses and conceptual abstractions of the data to the research team and the research supervisor to explore inquirer biases and to clarify the meanings and the basis for interpretations), and member checks (presenting the analysis of the data to informants for their confirmation or revision) (Guba and Lincoln, 1985). As part of the analysis, similarities and differences found in open coding about the compiled codes were clustered together to create categories (Axial coding). After data saturation, qualitative data was analysed manually based on Strauss and Corbin's framework (Corbin and Strauss, 1990).

### **3.9.2 Cycle two: Designing an intervention plan based on the identified needs**

Cycle two involved planning and designing of an intervention based on the identified needs. The research team used the data collected in cycle one, which included analysis of the use of an e-learning system in the selected nursing campuses and the perceptions and lived experiences of nurse educators, ICT managers and students in using the e-learning system.

In cycle two, various steps for intervention planning were adhered to as suggested by Jung, Gomez, Baird and Galyon-Keramidas (2008a): (i) refine e-learning platform goals, (ii) analyse baseline functional skills, (iii) identify natural learning opportunities, (iv) select empirically based strategies to facilitate learning, (v) ensure fidelity of instruction, (vi) design a data collection and analysis system, and (vii) evaluate the plan. In this second cycle, nurse educators and ICT managers, the expert recommended by the selected nursing school, and Tulane University (host of the UR Moodle Server) were informed about the key findings progressively, and were requested to participate in designing a sound plan for identified issues.

#### **3.9.2.1 Research questions**

The specific research questions for this cycle were:

- What processes and procedures should be involved in the utilisation of the e-learning platform at the selected nursing school campuses in Rwanda?
- What support should be provided to the users of the e-learning platform at the selected nursing school campuses in Rwanda?

#### **3.9.2.2 Research design**

This cycle was qualitative in nature, and focus group design was used. The focus group used in cycle one was also the one that was involved in the second cycle because of their expertise and willingness to support. Due to geographical constraints, communication was also done via e-mails and chat on Moodle, which was chosen as the method that would best suit everyone. According to Powell (1996), a focus group is a group of individuals selected and assembled by researchers to give comments, from personal experience, and discuss the topic that is the subject of the research. In using the focus group in this cycle, participants were invited to comment and share their perceptions on how the e-learning platform would be utilised.

### 3.9.2.3 Research setting

Planning the intervention to respond to the identified needs was done at one of the selected nursing campuses chosen by the research team. It was chosen as the setting because it had adequate resources to assist in planning and had been using an e-learning platform as a medium for teaching and learning, and because there was an urgent need to train nurse educators with the new academic year about to start.

### 3.9.2.4 Participants and sampling methods

Nurse educators, ICT managers and experts in the field of e-learning from two campuses participated in this cycle, since it is very important for the participants in action research to be enthusiastic and interested in the project so that they are motivated to seek changes (Altrichter, Feldman, Posch and Somekh, 2013; Banegas, Pavese, Velázquez and Vélez, 2013). Purposive sampling was used to select those who were willing to participate and provide meaningful information. Three active members who were experts in both technological and pedagogical domains were involved throughout the project.

### 3.9.2.5 Planning process for the intervention

The researcher and research team decided on the goals and purposes of the plan, based on the findings from the need analysis, and participants were selected for planning. Permission for the research was obtained from the dean of Nursing and Midwifery. Three participants who were experts in the field of teaching and learning using technology participated in the focus group. The dean of the school facilitated the process of contacting these experts in the fields. All the participants were approached and the purpose of the study was fully explained.

Once they had agreed to participate, a date and a venue for planning were identified. Participants were provided with a study information sheet and the consent form to sign. Respondents were informed that participation was anonymous and that no identifiable information should be mentioned in the focus group discussion. The interviews were not audio-recorded, as some participants considered it to be unnecessary and requested the facilitators to write down the key points during the focus discussion. The duration of the focus group session was about 40 minutes.

The focus group began with the dean of the school introducing the researcher and other participants, followed by the moderator (researcher) welcoming participants and briefing them on the process. They were informed that there were no right or wrong answers and that it was important to speak one at a time and maintain confidentiality. The moderator then asked a few simple “icebreaker” questions to help participants get used to the process and to help reduce any anxiety. This also helped the moderator to develop a rapport with the participants. The moderator presented some key findings from the previous cycle, and put the following questions to the participants: (i) What processes and procedures should be involved in the utilisation of the e-learning platform at the selected nursing school campuses in Rwanda? (ii) what support should be provided to the users of the e-learning platform at the selected nursing school campuses in Rwanda?

Following the prepared guide, the moderator managed the session and made sure that all topics were covered without overtly directing the discussion; probing questions were however used by the moderator to get more clarification. Participants were encouraged to express their views and even disagree with one another about the findings. The moderator used the probes to learn about participants’ thinking and attitudes.

The participants involved in this cycle was requested to develop strategies in response to the issues raised regarding the utilisation of the e-learning platform and the limited knowledge about using Moodle, and to make a plan for training nurse educators in the use of Moodle as a Learning Management System (LMS) at the selected nursing school campuses. Towards the end of a focus group session, the moderator gave participants the opportunity to discuss issues which had not been mentioned during the discussions and ask additional questions for clarification. Based on the issues raised by the lack of knowledge in terms of using Moodle as the LMS, the focus group of experts together with the researcher decided the training of nurse educators. The research team consulted literature to familiarise themselves with the theoretical and empirical work already done on using Moodle as LMS. The experts developed a plan with the researcher. Once the intervention plan was developed, a workshop was organised for its implementation, a date and venue were fixed.

### **3.9.3 Cycle three: Pilot testing and evaluation of the intervention plan**

Cycle three focused on piloting and evaluation of the intervention plan developed in cycle two, which in turn was based on the findings from cycle one.

### 3.9.3.1 Research questions

The specific research questions for this cycle were:

- What are the antecedents or casual conditions that led to the development of a middle-range theory of e-learning platform utilisation in nursing education?
- What forms the context for the e-learning platform in nursing schools?
- What are the roles of the different key players?
- What are the action and interaction strategies in the utilisation of the e-learning platform?
- What are the intervening conditions that mediate variables in the utilisation of an e-learning platform in nursing education?
- What intended or unintended consequences or outcomes are achieved in developing a middle-range theory for using an e-learning platform?

### 3.9.3.2 Research design

A workshop seminar was held at one of the selected nursing school campuses to pilot test the plan developed for training nurse educators in the use of Moodle.

### 3.9.3.3 Research setting

One of the selected nursing school campuses was selected for testing and evaluation of the intervention plan. The setting was chosen because it had adequate resources for implementation of the plan which had been developed, the campus had been using an e-learning platform as a medium for teaching and learning, and it was regarded as urgent since a new academic year was about to start.

### 3.9.3.4 Participants and sampling methods

A total of 15 participants participated in the seminar on the use of Moodle, all of them recruited via the school e-mail with the help of experts and the office of the dean of the school where the study was conducted. Purposive sampling was used, and those who participated in the pilot testing were required to inform or train their colleagues and students on the use of Moodle.

### 3.9.3.5 Inclusion criteria in Phase three

They were currently employed as nurse educators at the selected nursing school campuses. They were all involved in teaching nursing and midwifery students on daily basis, and they were willing to participate in the training seminar.

### 3.9.3.6 The process of pilot test and evaluation

The venue was set, and had a wireless connection to allow the participants to practice. The pilot testing started with a welcome to the participants by the dean of the selected school of nursing and midwifery. The researcher and expert who were conducting the workshop were asked to introduce themselves, followed by the other participants. Next, the researcher and e-learning expert team presented the agenda of the day, and began with a theoretical presentation of Moodle using PowerPoint and a projector. During the presentation, a number of questions was asked which were answered by the team and by some of the participants who had previously used the Moodle platform.

After the PowerPoint presentation, 15 participants were grouped into three different groups, and the three experts who were available, were each assigned a group to facilitate in creating an account on Moodle, showing each participant how Moodle functions practically in terms of uploading course contents, assignments, chats, forum discussion, and how they can monitor the participation of the students via Moodle logs. In the practical facilitation, a number of questions were asked about using Moodle which were answered by practical demonstrations in Moodle. Participants were advised to practice frequently.

After the workshop, evaluation was immediately done for each of the participants to confirm that the training has been successful. Open-ended questions were used to establish what lessons had been learnt from the workshop, and the facilitators asked a number of questions to make sure that participants were able to use Moodle. Field notes were taken by the researcher during the workshop and in an informal conversation with nurse educators for further analysis. The seminar ended with a debriefing of the research team and planning for the way forward. It was decided that a proper follow-up was necessary plus on-going programme evaluation which also generated further data. This follow-up was done via Moodle participation analysis, log reports, and activities to facilitate e-learning in nursing. The team of experts in e-learning gave Moodle platform access to the researcher with campus manager privileges which enabled her to analyse

the Moodle interface design and overall Moodle utilisation. The findings were shared among the team, which was very important as new data emerged.

### 3.9.3.7 Data analysis

The qualitative data collected was analysed and the mass of words generated from the interaction with the participants or observational data were described and summarised as recommended (Lacey and Luff, 2001). Transcriptions of the conversations were analysed using the constant comparative method (Heath and Cowley, 2004; Corbin and Strauss, 1990). Data was analysed as it was collected throughout using the coding process suggested by Strauss and Corbin (1990). The Strauss and Corbin (1990) framework was also used for qualitative data analysis.

The first coding procedure in data analysis is open coding, which is an analytic process in which concepts and their properties are identified, thereby forming codes (Strauss and Corbin, 1990). Open coding involves a method of breaking down, exploring, comparing, labelling and categorising data. In simple terms, open coding means assigning themes to quotes and categories (Strauss and Corbin, 1990). Open coding is defined as the analytic process through which concepts are identified and their properties and dimensions discovered in the data (Burden and Roodt, 2007). According to De Vos, Strydom, Fouché and Delport (2005), open coding pertains specifically to the naming and categorising of phenomena through close examination of the data. Without this first, basic analytical step the remainder of any analysis is difficult, if not impossible. In open coding, the data are broken down into discreet parts which are then closely compared for similarities and differences, after which questions are asked about the phenomenon embedded in the data (Heath and Cowley, 2004). In this study, through open coding, common themes of everyday life were identified and examined in relation to the context, meanings and utilisation of the e-learning platform at the selected nursing campus. Focus-group discussions and Moodle were coded by conceptualising underlying patterns in the data. Initial data analysis guided further focused data collection, leading to further conceptualisation of the data and refinement of the coding schemes.

The next coding procedure undertaken in the study was axial coding. According to Strauss and Corbin (1990), axial coding involves procedures for connecting the categories found in open coding. Axial coding involved further analysis and refinement of the list by deleting or combining some of the categories once connections had been made between them. Axial

coding is the process of relating categories to their sub-categories (Strauss and Corbin, 1990) to create code families. De Vos et al. (2005) define axial coding as a set of procedures in which data are put back together in new ways after open coding by creating associations between categories. In this study, through axial coding, similarities and differences between the compiled codes were clustered together to create categories. Conceptual saturation was reached when no new categories were generated. This was done according to a coding paradigm that involved conditions, context, action/interactional strategies and consequences in sub-categories related to a category. Data was analysed manually by the researcher and the co-coder.

### **3.9.4 Cycle four: Development of the middle-range theory for utilisation of e-learning platform in nursing education**

Cycle four dealt with middle-range theory development. Ideas and concepts were organised through reflection on the previous cycles and the outcome of the piloted intervention plan.

#### **3.9.4.1 Research questions**

The specific research questions for this cycle were:

- What is the core concept in this emerging e-learning platform utilisation middle-range theory?
- What are the main concepts and sub-concepts in the emerging middle-range theory?
- What is the relationship between and among the concepts and sub-concepts in this middle-range theory?
- What are the assumptions that emerge in this middle-range theory?

#### **3.9.4.2 Middle-range theory development process**

The researcher and the research team developed a middle-range theory based on the findings in the previous cycles. The research team reflected on the findings from the focus group and on previous cycles and consulted the literature to familiarise themselves with the theoretical and empirical work already done in relation to the development of a middle-range theory to guide the use of an e-learning platform in nursing schools in Rwanda. Online communication with the research team was organised by the researcher to develop a middle-range theory. In this cycle, the focus was on selective coding as suggested by Strauss and Corbin (1990). In the manual coding, the co-coder assisted in organising qualitative data from the interviews and

focus groups by identifying meaningful units which were then categorised and coded. All data within the same category was then grouped and sub-categories were developed as needed. Manual data analysis was also done.

According to Strauss and Corbin (1990), the final step in the analysis is selective coding, which involves the integration of concepts around a core category and the filling in of categories in need of further explanation and description. This type of coding is likely to occur in the later phases of a study. This stage involves the identification of a core category from which a model is developed (Strauss and Corbin, 1990). De Vos et al. (2005) state that selective coding entails selecting the core categories, systematically relating them to other categories, validating those relationships, and filling in categories that require further fine-tuning and modifications.

In this study, the core category represented the central phenomenon of the study, as outlined by Corbin and Strauss (1990). The core category is identified by asking questions such as, What is the main analytic idea presented in this research? If our findings are to be conceptualised in a few sentences, what do we say? What does all the action/interaction seem to be about? How can we explain the variation that we see between and among the categories? The core category might emerge from among the categories already identified or a more abstract term may be needed to explain the main phenomenon. The other categories always stand in relationship to the core category as conditions, action/interactional strategies, or consequences. Diagramming can assist in the integration of categories (Corbin and Strauss, 1990).

**Table 3-3: The grounded theory analytic process for the study: direction of analytic sequence Adopted from Harwood (2002)**

Open coding			Axial coding	Selective coding
Concepts Fracture & label the data: Manual coding	Categories Classify concepts: Properties Dimensions	Sub-categories Drill down categories: When? Where? How? Why?	Uncover relationships among categories: Mini-frameworks Conditions & Consequences The paradigm	Discover the 'core' category Develop theoretical framework
Direction of analytic sequence				
				

The paradigm model of Strauss and Corbin (1990) was used in linking the themes and categories to further illuminate the emerging constructs.

**Table 3-4: Components of the paradigm model Adapted from the paradigmatic model by Strauss and Corbin (1990).**

<b>Conceptualization of the phenomenon</b>	
Antecedent or causal conditions	
Context	
Action/inter action strategies	
Intervening conditions	
Consequences or outcomes	

Antecedents are often referred to as causal conditions (Mashele, 2009; Walker and Avant, 1995). Causal conditions or antecedents include factors such as pivotal life experiences, dilemmas, problems or crises. The properties of these causal conditions include arguments, disagreements, problems, moral issues, confrontations and perplexities (Mashele, 2009). Context signifies a specific set of properties or problems to which a person responds through actions or interactions. Context also refers to a particular set of conditions in which action–interaction strategies are taken to manage, handle, carry out and respond to a specific phenomenon (Strauss and Corbin, 1998).

Intervening conditions are the broad and general conditions bearing upon the action–interaction strategies (Strauss and Corbin, 1998). Action–interaction strategies are devised to manage, handle, carry out or respond to a phenomenon under a specific set of conditions (Strauss and Corbin, 1998). These are the strategic actions directed to the problem. Consequences are the outcomes or results of action–interaction processes (Strauss and Corbin, 1990).

After the development of the middle-range theory, a focus group was conducted online with the experts in e-learning and nursing education, ICT managers nurse educators, and campus managers to collect data on opinions and suggestions on the middle-range theory developed, and participants discussed its implementations. The research team reflected on the views from the participants regarding the implementation of the middle-range theory in e-learning. The research team then refined the middle-range theory in the form of a network of interlinked concepts that together provided a comprehensive understanding of e-learning in nursing education in Rwanda. The concepts that constitute the middle-range theory, support one another, articulate their respective phenomena and establish a middle-range theory-specific philosophy as recommended by Jabareen (2009).

#### 3.9.4.3 Research setting

One of the selected nursing school campuses was used to collect the views of the participants on the developed middle-range theory for using an e-learning platform in nursing education in Rwanda, and their opinions on its implementation. The research team decided it would be appropriate to implement it in the post-doctorate phase, as they felt it would constitute a study on its own.

#### 3.9.4.4 Participants and sampling methods

Nurse educators and ICT managers who were working in the selected nursing school were requested to participate in this cycle. The research team was involved, together with the team of experts in nursing education and e-learning, and an online focus group was created. There were no inclusion or exclusion criteria as all who were willing to participate were welcomed.

#### 3.9.4.5 Research instrument and data collection process

A focus group interview guide was used to present the developed middle-range theory to the participants and to collect their views on possible amendments and implementations.

Permission for the research was obtained from the participants who were involved in this cycle. All the participants provided their views via online discussion, Moodle, and emails. Once the middle-range theory had been developed there was another workshop to present final reports to the participants from all three nursing campuses and discuss its implementation.

### **3.10 VALIDITY AND RELIABILITY OF QUANTITATIVE DATA**

Validity and reliability as indicated below were for the structured research instruments used in cycle one of the study, which explored needs related to the use of an e-learning platform in selected nursing campuses.

#### **3.10.1 Validity**

In cycle one, quantitative data were collected using a structured questionnaire and it was necessary to test their validity. According to Polit and Beck (2004), validity is the degree to which an instrument measures what is supposed to measure. The validity in this study was determined through cross-validation between content validity and face validity in regard to the questions asked being specific and chosen according to the objectives of the study, the conceptual framework, the literature, the research methodology, experts opinions, the statistician and IT staff. In the study, content validity was used as a means of ensuring the validity of the data collection instruments (questionnaires for nurse educators, students, ICT managers and managers of campuses) to assess how well the instruments represented all components of the variables to be measured (Annexure 10, 11, 12, 13), as recommended by Brink (2006).

#### **3.10.2 Reliability**

In cycle one of the study, structured questionnaires were used and their reliability was tested. According to Polit and Beck (2004), the reliability of the instrument is the consistency with which it measures the targeted attributes. Reliability is also concerned with the accuracy of the questionnaire in reflecting the true scores. Gerish and Lacey (2006) state that reliability is a

measure of the consistency and accuracy of data collection. In this study, reliability was measured using Cronbach's Alpha coefficient, which is a method to evaluate the internal consistency of the instrument (Polit and Beck, 2004). The higher values reflect a higher internal consistency. Polit and Beck (2004) point out that 0.7 is an acceptable reliability coefficient; the coefficient of 0.7 was accordingly used for the study.

The structured questionnaires (for nurse educators, students, campus managers and ICT managers) on two occasions were distributed to a group of 5 nursing students and 5 teachers who were not part of the study. The instruments were distributed in an interval of one week. The test of reliability revealed an internal consistency. In this study, Cronbach's Alpha for nursing students' questionnaire was 0.978; 0.889 of teachers' questionnaire; 0.746 for campus managers' questionnaire, and 0.713 for ICT managers' questionnaire.

### **3.11 TRUSTWORTHINESS OF THE QUALITATIVE DATA**

Introduction of Lincoln and Guba's ideas on trustworthiness provides an opportunity for naturalistic inquirers to explore new ways of expressing validity, reliability and generalizability outside the linguistic confines of a rationalistic paradigm (Tobin and Begley, 2004). There are various criteria that can be applied in evaluating the quality of data, and for the qualitative data that was collected in the four cycles of this study the following strategies and criteria, as outlined by Lincoln and Guba (1985), were used to establish trustworthiness: credibility, transferability, dependability, conformability and authenticity. These criteria are considered as establishing validity and reliability in quantitative research and were applied in all four cycles of the study, as qualitative data was collected continuously (Annexure 14).

#### **3.11.1 Credibility**

According to Guba and Lincoln (1994), credibility is aimed at addressing the authenticity of the data collected and assesses the degree to which the theoretical concepts which emerge are actually grounded in the data. Tobin and Begley (2004) state that credible techniques of data collection and analysis ensure that the participants' views and expressions are accurately represented in the researcher's meaning. Denzin and Lincoln (1994) and Botma, Greeff, Mulaudzi and Wright (2010) suggest prolonged engagement, triangulation of data and member checking as some techniques which can be employed to ensure credibility. Strategies that were adopted to achieve credibility are shown in Annexure 14.

### **3.11.2 Transferability**

According to Munhall (2003), transferability measures factored into the qualitative research ensure that study findings can be applied to other situations. Lincoln and Guba (1985) advise researchers to provide sufficient contextual information about the fieldwork sites so that readers of the findings can make a transfer to another setting. In this study, a thick dense description was provided throughout the study, and strategies are listed in Annexure 14.

### **3.11.3 Dependability**

Dependability focuses on the stability of the research data (Guba and Lincoln, 1994). The fluid nature of human experiences, which is central to the naturalistic paradigm of qualitative research, sometimes makes the stability and dependability of study findings problematic, and a thick description of the study setting, the data collection plan and the procedure for data collection should be specified (Shenton, 2004). Incorporated in this study were a dense description of methodology used, triangulation of the findings and dependability audit (primary data was kept in a safe place by my supervisor and I for a period of five years), dense description of methodology and decision-making, correct reference techniques, external reviewers, supervisor and consensus discussion with research team members. The expertise of the research supervisor on action research was helpful (Annexure 14).

### **3.11.4 Confirmability**

Confirmability refers to the objectivity of the study procedures and the findings thereof (Guba and Lincoln, 1994). In this study, confirmability was ensured through confirmability of the data findings and reflexivity. The research paradigm and data collection and analysis were provided. Field notes were constantly taken and the researcher and the research team reflected continuously on the research process. The researcher transcribed verbatim all audio recorded during the data collection sessions. The research supervisor was provided with this information for peer examination (Annexure 14).

## **3.12 ETHICAL CONSIDERATIONS**

The study began once the research proposal had been approved by the research ethics committee of the University of KwaZulu-Natal, permission had been granted by the School of Nursing at the University of Rwanda where the study was conducted, and research clearance

and permission had been provided by the Ministry of Education, and permission had been obtained from all participants by their signing of the consent form (Annexures 19, 20, 21, 22). As prescribed by Brink, Van Der Walt and Van Rensburg (2006) and the World Medical Association Declaration of Helsinki (2004), the research study adhered to ethical principles, and the following considerations were observed:

- A two-page participation Information letter was provided to each person explaining the purpose of the research and the nature of the questionnaire (Annexure 2). They were also provided with a consent form for participation in the study which they signed before answering any questions (Annexure 1).
- The principle of justice was adhered to by ensuring the participants' confidentiality. During the data collection processes, the researcher and the research team instructed the participants not to write their names on the questionnaires, and in-depth interviews were conducted in a secure and closed room. It was explained to them that the completion of the questionnaire required signing a consent form. The participants were assured that no sensitive information would be divulged in the publication of the study results.
- All prospective participants were informed of the purpose of the study and of the fact that the research results would be made available to all respondents.
- The participants had the right to decide voluntarily whether or not to participate in the study without any risk of penalty or prejudicial treatment.
- The principle of beneficence rules that the wellbeing of the participants is maintained. The researcher and the research team ensured that no discomfort or inconveniences occurred in the data collection.

Because action research is carried out in real-world circumstances, and involves close and open communication among the people involved, the researchers must pay close attention to ethical considerations in the conduct of their work. Winter (1996) lists a number of principles:

- Make sure that the relevant persons, committees and authorities have been consulted, and that the principles guiding the work are accepted in advance by all.
- All participants must be allowed to influence the work, and the wishes of those who do not wish to participate must be respected.
- The development of the work must remain visible and open to suggestions from others.

- Permission must be obtained before making observations or examining documents produced for other purposes.
- Descriptions of others' work and points of view must be negotiated with those concerned before being published.
- The researcher and the research team must accept responsibility for maintaining confidentiality.

### **3.13 DATA MANAGEMENT**

The data is stored by the researcher in a locker in a secured room, accessible only to the researcher's supervisor. The data sheets will be kept for five years in the secure environment, after which they will be shredded. The raw digital data are kept on the researcher's computer which is accessed and controlled through password protection. It was backed up onto the university system for safekeeping.

### **3.14 CONCLUSION**

This chapter covered the philosophical basis for the study approach. It described the research paradigm design, the research team and its selection, different action research cycles and how they were conducted. For each cycle, the following were described: research settings, population, sampling and sample size, data collection and data analysis. It covered also the trustworthiness, ethical guidelines, and data management. Briefly, this was a blueprint of activities at the various phases of the action research.

## **CHAPTER 4**

### **PRESENTATION OF THE FINDINGS**

#### **4.1 INTRODUCTION**

This chapter focuses on the findings of the research carried out to analyse the utilisation of an e-learning platform at a selected nursing school in Rwanda. The data presented was the result of data collected from the multiple sources (surveys with structured questions, participant interviews, focus group discussion and document analysis) which were used in this study. The aim of the of this study was subdivided into two: (i) Collaboratively analyse the utilisation of the e-learning platform at selected nursing school campuses at UR, in Rwanda, (ii) Develop a middle-range theory on the implementation of e-learning at selected nursing school campuses at UR, in Rwanda.

To reiterate, the objectives of this study were: (i) To analyse the processes and procedures involved in the utilisation of the e-learning platform at selected nursing school campuses, at UR; (ii) To explore the perceptions of the users of the e-learning platform at selected nursing school campuses, at UR; (iii) To explore the support provided to the users of the e-learning platform at selected nursing school campuses, at UR; (iv) To describe the intervening conditions bearing upon utilisation of the e-learning platform.

This was guided by pragmatic paradigm, as it used action research and mixed methods for data collection and analysis. In accordance with the convergence parallel mixed methods used in this study, adopted from Creswell (2007), quantitative data are presented first, and descriptive statistics were used to describe the characteristics of the research participants and their quantitative responses. Averages and percentages were used in the representation of the data from this study. Spearman and Pearson's correlations were used to establish the relationship between various constructs related to this study. Qualitative data from all the first three cycles of this study were then analysed and presented, based on the Strauss and Corbin (1990) framework of grounded theory, as the overall aim of this study is to develop a middle-range theory that would guide the utilisation of an e-learning platform in nursing education in Rwanda. The triangulation of quantitative and qualitative findings is done in Chapter 5 (Discussion of the findings), with qualitative data dominating.

According to Denzin and Lincoln (2013), researchers have identified grounded theory as a useful qualitative method to adopt in mixed methods research. The rapid rise of the mixed methods is a movement heralding a paradigm shift analogous to the qualitative researcher that Denzin and Lincoln began in 1994. Mixed methods in grounded theory take into account triangulations of the findings (Denzin and Lincoln, 2013), and Creswell and Plano Clark (2007) argue that the qualitative method extends mixed methods practice, and may be given priority in mixed methods projects. For the purpose of this study, mixed methods were used for various purposes, including collecting multiple data from different sources to analyse extensively the utilisation of e-learning in nursing education, corroborating findings, reducing cultural investigators biases, addressing participants experience, demonstrating credibility, increasing generalizability, and informing professional practice and/or public policy, as outlined by Creswell (2003).

A portion of the analysis from the initial phase produced two articles published in IOSR Journal of Nursing and Health Science (IOSR-JNHS):

1. *E-Learning in Nursing Education in Rwanda: Benefits and Challenges. An Exploration of Participants' Perceptives* found at: DOI: 10.9790/1959-0502036492
2. *Analyzing Nursing Students' Perception on the Utilization of E-Learning Platform in Rwanda: A Descriptive Study* found at: DOI: 10.9790/1959-0502031939

## **4.2 QUANTITATIVE DATA PHASE**

The participants in the quantitative survey comprised four structured instruments (for nursing students, nurse educators, ICT managers and campus managers) from the three selected campuses. To reiterate, the sampling method was stratified for each of three campuses, followed by simple random sampling. A total of 275 participants responded to the questionnaires (227 nursing students, 44 nurse educators, 2 ICT managers, 2 campus managers). The overall response rate from the three campuses was 90.4% for nursing students, 57.1% for nurse educators, 75% for ICT managers and 75% for campus managers.

To reiterate, the participants (second- and third-year nursing students who were enrolled in e-learning, nurse educators, ICT managers, and the campus managers) were given structured questionnaires. Taking account of the categories of the participants and the questionnaires

distributed to them, the main findings were presented according to each participant category, and all the findings together are discussed in Chapter 5.

The research questions to be answered in this quantitative phase were: (i) How is the e-learning platform currently utilised in the selected nursing school? (ii) How do nurse educators facilitate the students through e-learning in the selected nursing school? (iii) How do nursing students use the e-learning platform? (iv) How are the users of the e-learning platform supported in the selected nursing school? (v) What intervening conditions facilitate or hinder the use of an e-learning platform in the selected school?

The findings are presented in figures and tables. To reduce overload in this chapter, some of the tables of cross tabulations and correlation of various variables have been put in annexures and are merely referenced in this chapter. The analysis was done using the Statistical Package for the Social Sciences (SPSS) for Windows, version 23. Cross tabulations and Pearson's Chi-square analysis were used to determine the extent of association between socio-demographic variables and the utilisation of e-learning. A p. value of  $< 0.05$  was considered as statistically significant. Pearson correlation analysis was performed to determine the relationship between each of the variable in a parametric distribution of the responses, and Spearman was used in non-parametric distributions of the responses. In both cases, a confidence interval of 95%, and factors that had a p-value less than 0.05, were considered significant.

One-way analysis of variance (ANOVA) is used to determine whether there are any significant differences between the means of three or more independent (unrelated) groups. However, because ANOVA testing determined whether there was an overall difference between the groups but did not show which specific groups differed, a post hoc test was performed. This was done to confirm where the differences occurred between groups (for example in three campuses), and a confidence interval of 95% and factors that had a p-value less than 0.05 was considered significant.

### **4.3 SOCIO-DEMOGRAPHIC PROFILE OF QUANTITATIVE PHASE PARTICIPANTS**

The findings indicate that 227 nursing students from three campuses of the selected nursing school in Rwanda responded to the questionnaires. their socio-demographic characteristics were as follows.

#### **4.3.1 Quantitative data set one (nursing students)**

Of 227 nursing students who participated in this study, regarding gender, the majority 64.3% (n=146) were females and 35.7% (n=81) were male. Of the 227 nursing student participants, the minimum age was 28 years and the maximum age was 50 years; mean age was 36.09 years; standard deviation (SD) was 4.434. All were enrolled in an advanced diploma nursing program. The majority (68.3%, n=155) were in the second year, and 31.7 (n=72) were in the third year. All students who were enrolled in e-learning and participated in this study were in General Nursing 100% (n=227). As shown in Table 4-1, of 227 nursing students who participated in this study, 38% (n=87) were from campus A, 31.7% (n=72) were from campus B, and 30% (n=68) were from campus C.

#### **4.3.2 Quantitative data set two (nurse educators)**

Of 44 nurse educators who participated in this study, the minimum age was 27 and the maximum age was 57; mean age was 34.59 and the standard deviation (S.D) was 7.215. The majority, 68.2% (n=30), were female, and 31.8% (n=14) were male. Regarding highest qualification, 54.5% (n=24) of the participants had a bachelor's degree, 22.7% (n=10) had an honour's degree, 18.2% (n=8) had an advanced diploma, and 4.5% (n=2) had a master's degree. The majority of nurse educators, 70.5% (n=31) did not have a qualification in nursing education and only 29.5% (n=13) reported to have a qualification in nursing education. The minimum number of working years' experience was 2 years and the maximum number of working years' experience was 15 years; mean working years' experience was 4.91 and the standard deviation (S.D) was 3.139.

#### **4.3.3 Quantitative data set three (ICT managers)**

Of two ICT managers who participated in this study, one was in the 30- to 34-year age group and the other was in the 35- to 40-year age group. Both were male. Highest qualifications were a bachelor's degree and a qualification in ICT or computer science. Their working experience ranged between 1 and 5 years and between 6 and 10 years respectively. They were from campus B, and C respectively.

#### **4.3.4 Quantitative data set four (campus managers)**

Of the two campus managers who participated in this study, one was in the 30- to 34-year age group and the other was in the 40- to 50-year age group. One was male and the other was female. One had a master's degree as a highest qualification and the other had a bachelor's degree. Both had a qualification in nursing education. Regarding their working experience, one had been a campus a manager for less than 3 years while the other had more than 21 years' experience as a campus manager (Table 4-1).

**Table 4-1: Sociodemographics of quantitative survey participants**

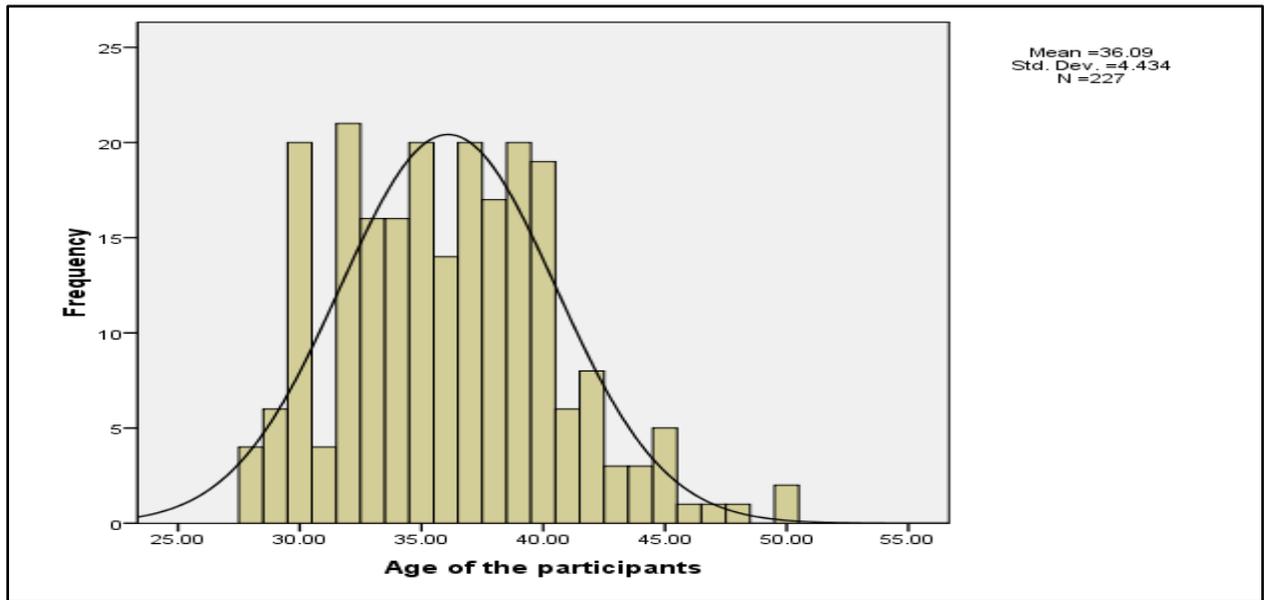
	VARIABLES	FREQ.	%
<b>Nursing students group (n=227)</b>			
Gender	Male	81	35.7%
	Females	146	64.3%
Age group	28-33 years	71	31.3%
	34-39 years	107	47.1%
	40-45 years	44	19.4%
	46-51 years	5	2.2%
Program of enrolment in 2015	Nursing program	227	100%
Level of the study	2nd year	155	68.3%
	3rd year	72	31.7%
<b>Nurse educators group (n=44)</b>			
Gender	Males	14	31.8%
	Females	30	68.2%
Age category	27-30 years	19	43.2%
	31-40years	17	38.6%
	41-50 years	6	13.6%
	51-60 years	2	4.5%
Highest qualification	Master's degree	2	4.5%
	Honour's degree	10	22.7%
	Bachelor's degree	24	54.5%
	Diploma	8	18.2%
Qualification in nursing education	YES	13	29.5%
	NO	31	70.5%
Number of years of working experience	1 to 3 years	21	47.7%
	4 to 6 years	13	29.5%
	7 years and above	10	22.7%
<b>Campus managers group (n=2)</b>			
Gender	Males	1	50%
	Females	1	50%
Age category	30-40	1	50%
	41-50	1	50%
Highest qualification	Masters' degree	1	30%
	Bachelor's degree	1	50%
Qualification in nursing education	Yes	2	100%
Number of years of working experience	Less than 3 years	1	50%
	21 years or more	1	50%
<b>ICT MANAGER group (n=2)</b>			
Gender	Males	2	100%
Age group	30-34 years	1	50%
	35-40years	1	50%
Highest qualification	Bachelors' degree	2	100%
Qualification in ICT or computer science	Yes	2	100%
Number of year of working experience	1-5 years	1	50%
	6-10 years	1	50%

## 4.4 FINDINGS FROM QUANTITATIVE DATA SET ONE: NURSING STUDENT PARTICIPANTS

### 4.4.1 Sociodemographic characteristic of nursing students

#### 4.4.1.1 Age of nursing students

Of 227 participants the minimum age was 28 years and the maximum age was 50 years; mean age was 36.09 years, and the standard deviation (SD) was 4.434 (Figure 4-1).



**Figure 4-1: Histogram of age of participants (n=227)**

#### 4.4.1.2 Gender of nursing students

The majority of nursing students, 64.3% (n=146), were female and 35.7% (n=81) were male. All were enrolled in and advanced diploma nursing program.

#### 4.4.1.3 Year of study of nursing student participants

Of 227 participants, the majority, 68.3% (n=155), were enrolled in the second year, and 31.7% (n=72) were in the third year (Table 4-2).

#### 4.4.1.4 Program of enrollment of nursing students

All students who were enrolled in e-learning and participated in this study were in General Nursing 100% (n=227) (Table 4-2).

#### 4.4.1.5 Campus of the study of the participants in a selected school

As shown in Table 5 2, of 227 nursing students who participated in this study, 38% (n=87) were from campus A, 31.7% (n=72) were from campus B, and 30% (n=68) were from campus C.

**Table 4-2: Socio demographics of nursing student participants**

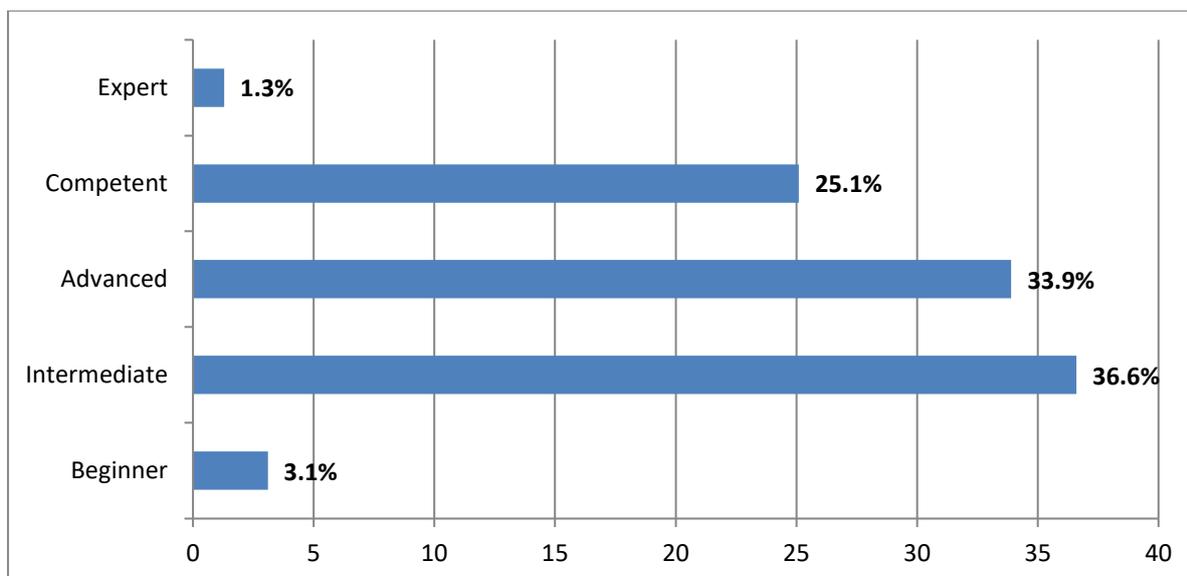
Variables		Frequency	Percentage
Campus	Campus A	87	38.3%
	Campus B	72	31.7%
	Campus C	68	30.0%
Gender	Male	81	35.7%
	Female	146	64.3%
Age group	28-33 years	71	31.3%
	34-39 years	107	47.1%
	40-45 years	44	19.4%
	46-51 years	5	2.2%
Program of enrolment in 2015	Nursing program	227	100%
Year of study	2nd year	155	68.3%
	3rd year	72	31.7%

#### 4.4.2 Knowledge and skills in using computers and the Internet

This section presents the findings related to the knowledge and skills of the respondents in using the internet: (i) perceived level to use competence level of using computers, (ii) ability to use the internet, (iii) activities performed by respondents when they access the internet, (iv) access to the internet, (v) awareness about electronic resources, (vi) how respondents were informed about the existence of electronic resources, (vii) search engines used, (viii) frequency of use of the internet for academic-related activities, and (ix) social networking used by the respondents.

##### 4.4.2.1 Perceived level of competence in using computers

Regarding perceived level of competence in using computers, of 227 respondents, 36.6% (n=83) perceived themselves to be at intermediate level, 33.9% (n=77) at an advanced level, 25.1% (n=57) at a competent level, 3.1% (n=7) at beginner's level, and only 1.3% (n=3) considered themselves to be experts. The variables were coded from 1 to 5, 1=beginner and 5=expert. The mode was 3, and the median 2. These findings indicated that few perceived themselves to be at the beginner's level; this might due to the fact that they had been exposed to computer technology before their enrolment to the selected nursing education institutions, and their exposure to computers during two and three years of studying in these institutions (Figure 4-2).



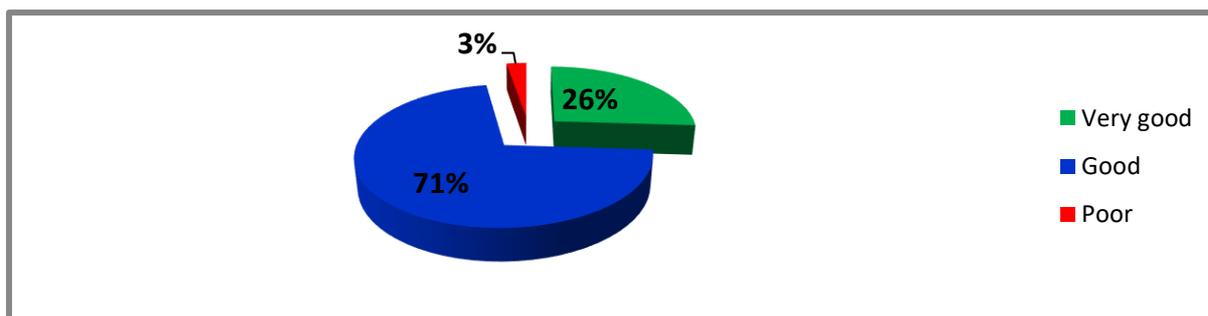
**Figure 4-2: Perceived level of competence in using computers (n=227)**

#### 4.4.2.2 Correlation between constructs related to e-learning and perceived competencies in using computers by nursing students

A Pearson correlation was run to determine the relationship between the sociodemographic characteristics of nursing students and constructs related to e-learning and their perceived level of competence in using computers. A significant relationship was found between their campuses and their perceived level of using computers ( $r = .239$ ,  $n = 227$ ,  $p < .000$ ), perceived ability to use Internet ( $r = -.302$ ,  $n = 227$ ,  $p < .000$ ), search engines used ( $r = .137$ ,  $n = 227$ ,  $p = .039$ ), social networking sites used ( $r = .137$ ,  $n = 227$ ,  $p = .048$ ), frequency of activity done on Internet ( $r = .140$ ,  $n = .035$ ), areas of access to Internet on campus ( $r = .133$ ,  $n = 227$ ,  $p = .046$ ), access to Internet off campus ( $r = .266$ ,  $n = 227$ ,  $p < .000$ ), and frequency of access to Internet per month ( $r = .183$ ,  $n = 227$ ,  $p = .006$ ). A chi-square test was performed to see the association between the campus of the participants and the perceived level of using computers, and it was found that statistically significant that there is an association between the campuses and the perceived level of using computers ( $X^2 = 19.355$ ,  $df = 8$ ,  $p = .005$ ).

#### 4.4.2.3 Ability to use the internet according to nursing students

For ability to use the internet, the majority of nursing student participants, 71% ( $n = 162$ ), said they had a good ability, 26% ( $n = 59$ ) said that they had very good ability, 3% ( $n = 6$ ) had a poor ability, and none reported having a very poor ability to use the internet (Figure 4-3).



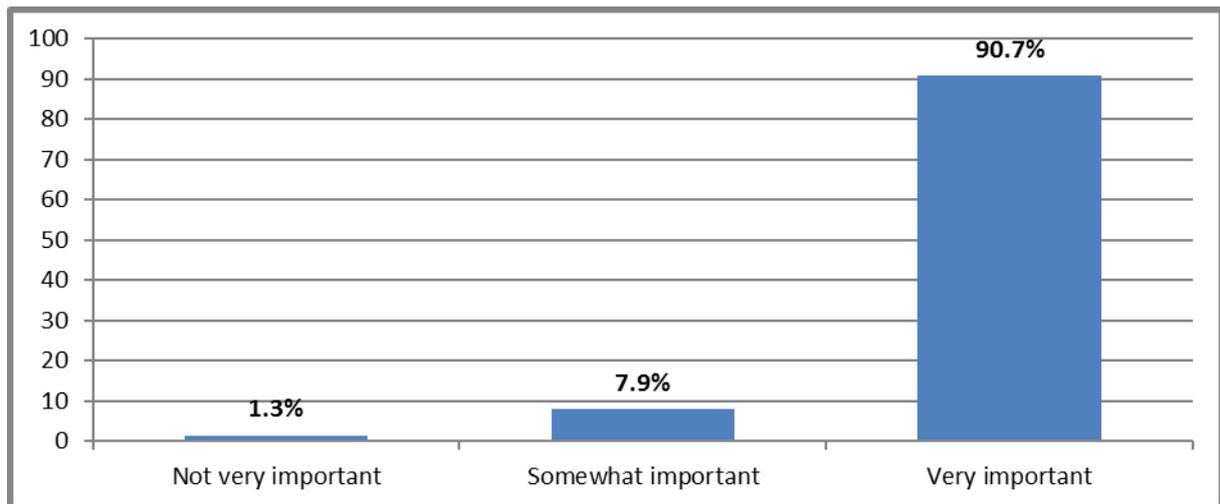
**Figure 4-3: Perceived ability to use the internet according to nursing students (n=227)**

A chi square test was performed to see the association between sociodemographic characteristics of the nursing students (campus, age, gender, and year of study), and ability to use internet. There was statistically a positive association between the campus of the nursing students and their perceived ability to use the Internet ( $\chi^2=15.638$ ,  $df=4$ ,  $p= .003$ ), and there were no other significant associations between other variables and the ability to use the internet: age ( $\chi^2=8.992$ ,  $df=6$ ,  $p= .187$ ), gender ( $\chi^2= .98$ ,  $df=2$ ,  $p= .952$ ) and year of study ( $\chi^2= .578$ ,  $df=2$ ,  $p= .749$ ).

A Pearson correlation was run to determine the relationship between constructs related to e-learning and perceived ability to use the Internet by nursing students. A significant relationship was found between the following variables: competence level in using computers ( $r= -.302$ ,  $n=227$ ,  $p< .000$ ); social network sites used ( $r= -.200$ ,  $n=227$ ,  $p= .002$ ), frequency with activities done on the Internet ( $r= -.146$ ,  $n=227$ ,  $p= .028$ ); frequency of access to the Internet per month ( $r= -.230$ ,  $n=227$ ,  $p< .000$ ); number of hours spent on the Internet per week ( $r= -.199$ ,  $n=227$ ,  $p= .003$ ); perceived need of orientation in ICT ( $r= -.166$ ,  $n=227$ ,  $p= .012$ ).

#### 4.4.2.4 Level of importance of the Internet in participant's life

Nursing students participants perceived that the Internet was important in their lives. Of 227 nursing students, the majority, 90.7 (n=206), reported that the Internet was very important in their lives, 7.9% (n=18) somewhat important, and a small percentage, 1.3% (n=3), that it was not very important in their lives (Figure 4-4).

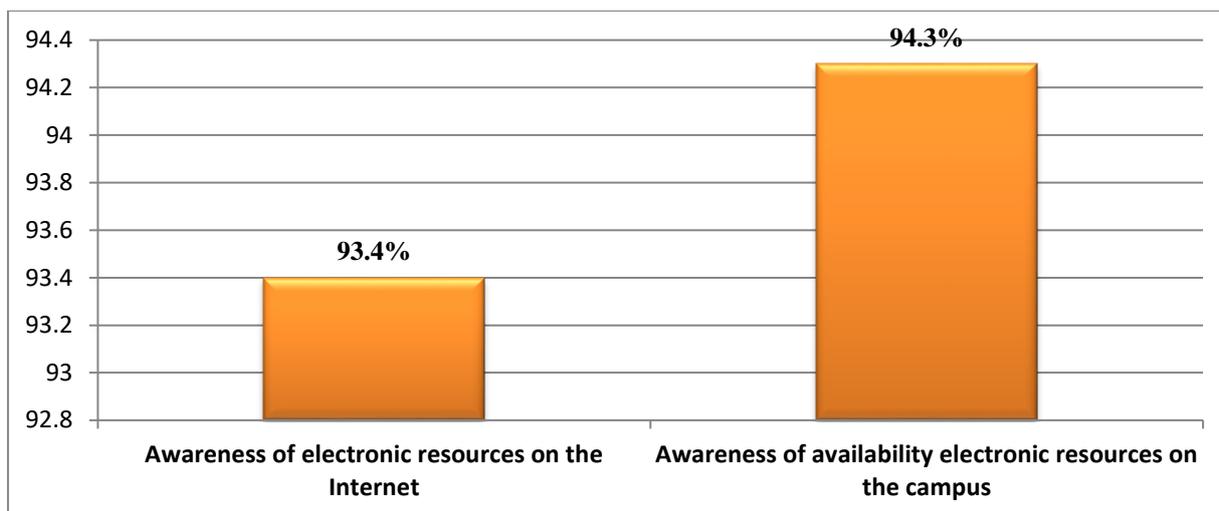


**Figure 4-4: Level of importance of Internet in nursing students' lives (n=227)**

A Pearson chi square test was performed to see the association between sociodemographic characteristics of the nursing students (campus, age, gender, and year of study), and the level of importance of the Internet in student's life. There was a statistically positive association between the campus of nursing students and their perceived level of importance of the Internet in their lives ( $\chi^2=13.228$ ,  $df=4$ ,  $p= .010$ ), and the year of study on exact Fisher test value was 8.367, and  $p= .008$ . There were no other significant associations between other variables and importance of the Internet in the life of the student: age ( $\chi^2=6.549$ ,  $df=6$ ,  $p= .343$ ), gender ( $\chi^2=1.750$ ,  $df=2$ ,  $p= .417$ ), which indicated there was no association statistically between age or gender and the perceived level of importance of the Internet in the students' lives.

#### 4.4.2.5 Awareness of electronic resources on the internet and their availability on campus

Of 227 nursing student participants, the majority, 93.4% (n=212), were aware of electronic resources on the Internet while a small percentage were not aware, 6.6% (n=15). It was further noted that out of 227 nursing students, the majority, 94.3% (n=214), were aware of electronic resources available on campuses while a small percentage were not aware 5.7% (n=13) (Figure 4-5).



**Figure 4-5: Awareness of electronic resources on the internet and their availability on campus (n=227)**

#### 4.4.2.6 How participants are informed about the electronic resources

The study found that nursing students were informed about electronic resources. Of 227 nursing students, the majority, 82.4% (n=187) were informed by their lecturers, 72.7% (n=165) were informed from Google Scholar, 67.4% (n=153) were informed from library orientation, 58.6% (n=133) from Yahoo, 49.8% (n=113) were informed from fellow students, and 28.6% (n=65) were informed from the library web page.

**Table 4-3: How nursing students are informed about electronic resources (n=227)**

	Yes		No	
	Freq.	%	Freq.	%
Library orientation	153	67.4	74	32.6
Lecturers	187	82.4	40	17.6
Fellow students	113	49.8	114	50.2
The library web page	65	28.6	162	71.4
Google Scholar	165	72.7	62	27.3
Yahoo	133	58.6	94	41.4

Chi square and Fisher exact tests were performed to determine the association between sociodemographic characteristics and how nursing students are informed about electronic resources. There was a statistically significant association between year of study and library orientation (F=21.710, p< .000: two sided); with fellow students (F=25.599, p< .000: two sided); library webpage (F=15.810, p< .000, two-sided); Google Scholar and year of study (F=32.996, p< .000: two sided); Yahoo and how nursing students are informed about electronic resources (F=18.748, p<.000: two sided); Yahoo and year of study (F=19.746, p< .000: two-sided).

A Pearson correlation was run to determine the relationship of how nursing students are informed about electronic resources and other variables. There were significant relationships with the following variables: campus ( $r = -.194$ ,  $n=227$ ,  $p = .003$ ); year of study of the participant ( $r = -.332$ ,  $n=227$ ,  $p < .000$ ); search engines used ( $r = .586$ ,  $n=227$ ,  $p < .000$ ); social network websites ( $r = .351$ ,  $n=227$ ;  $p < .000$ ); frequency of activities done on the Internet ( $r = -.203$ ,  $N=227$ ,  $p = .002$ ); setting of access to the Internet ( $r = .310$ ,  $n=227$ ,  $p < .000$ ); areas of access to the Internet on campus ( $r = .248$ ,  $n=227$ ,  $p < .000$ ); number of hours spent on the Internet per week ( $r = .265$ ,  $n=227$ ,  $p < .000$ ); problems encountered when using the Internet facilities on campus ( $r = .256$ ,  $n=227$ ,  $p < .000$ ); perceived biggest problems in using Internet ( $r = .140$ ,  $n=227$ ,  $p = .036$ ); and learning activities performed in the e-learning system ( $r = .453$ ,  $n=227$ ,  $p < .000$ ).

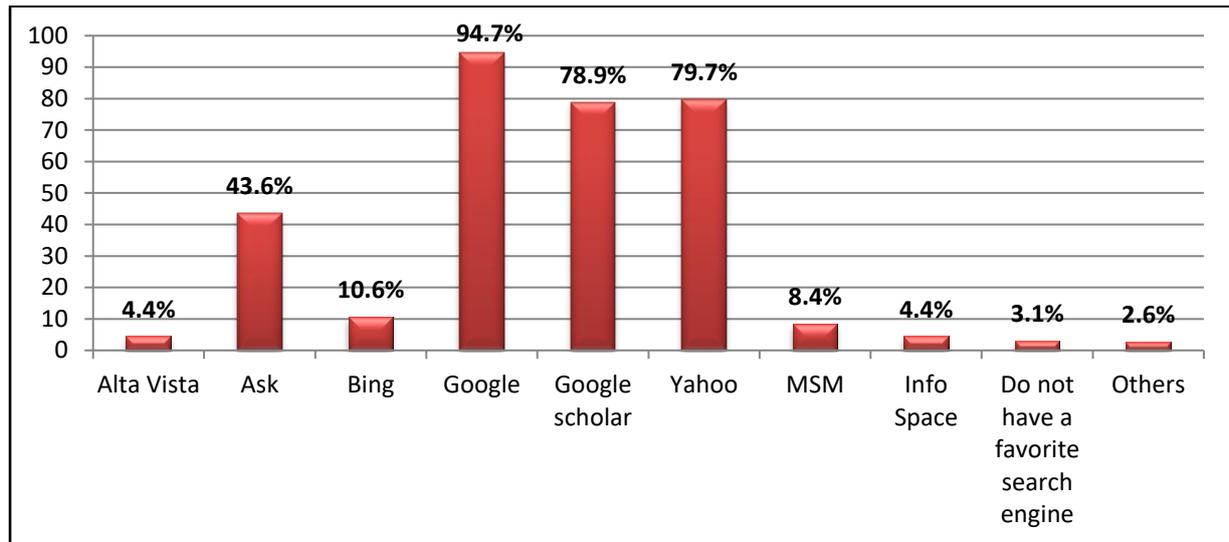
After observing that there was a significant relationship between how students were informed about electronic resources and the campus of the students at a selected school, one-way ANOVA was conducted and there were statistically significant differences between groups (campuses) means as determined by ANOVA ( $F=9.945$ ,  $p < .000$ ). To establish which group differed, a post hoc test was performed that compared the differences among the three campuses in relation to informing their students about electronic resources, and it was found that the mean difference of Campus C was statistically significant from campus A and B, as indicated in Table 4-4 [Campus A and C ( $F = .8648$ ,  $p = .006$ ); Campus B and C ( $F = -1.2010$ ,  $p < .000$ )].

**Table 4-4: Multiple comparisons in post hoc test of campuses and how students know about electronic resources (n=227)**

		Mean Difference			95% Confidence Interval	
(I) Campus	(J) Campus	(I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Campus A	Campus B	-.3362	.26183	.440	-.9814	.3090
	Campus C	.8648*	.26601	.006	.2093	1.5203
Campus B	Campus A	.3362	.26183	.440	-.3090	.9814
	Campus C	1.2010*	.27790	.000	.5162	1.8858
Campus C	Campus A	-.8648*	.26601	.006	-1.5203	-.2093
	Campus B	-1.2010*	.27790	.000	-1.8858	-.5162
Based on observed means.						
The error term is Mean Square (Error) = 2,701.						
*. The mean difference is significant at the .05 level.						

#### 4.4.2.7 Search engines used by the nursing students

Nursing student participants used various search engines. Of 227 nursing students, the majority, 94.7% (n=215), reported that they used Google; 79.7% (n=181) used Yahoo; 78.9% (n=179) used Google Scholar; 43.6% (n=99) used Ask; 10.6% (n=24) used Bing; 8.4% (n=19) used MSM; 4.4% (n=10) used Alta Vista; 4.4% (n=10) used Info Space; 3.1% (n=7) did not have a favourite search engine; and 2.6% (n=6) used others (unspecified (Figure 4-6).

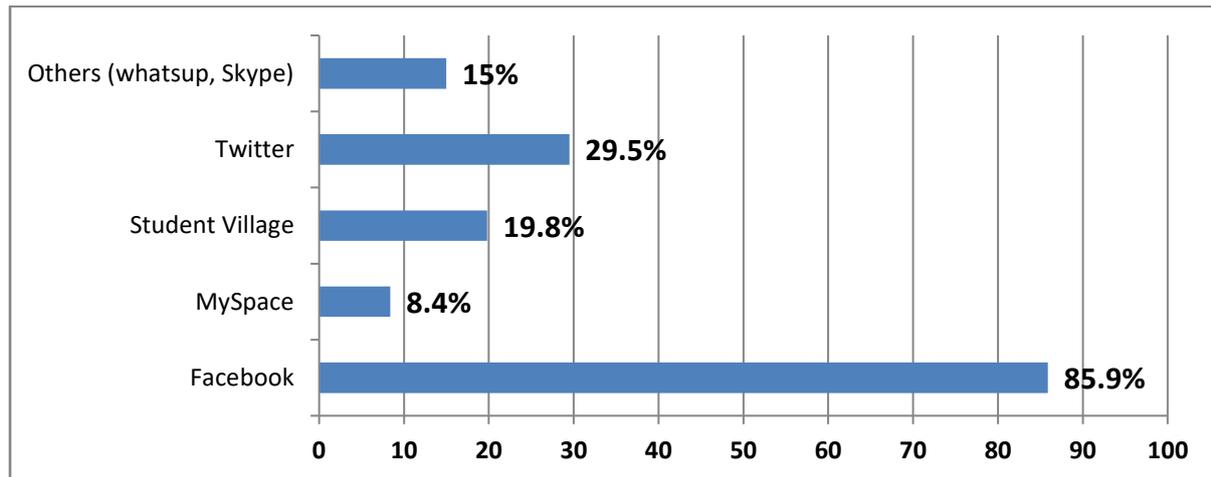


**Figure 4-6: Search engines used by the nursing students (n=227)**

A Pearson correlation was run to determine the relationship the search engines used and different variables. There were significant relationships with the following variables: The year of study ( $r = -.249$ ,  $n=227$ ,  $p < .000$ ); perceived level of competence in using computers ( $r = .137$ ,  $n=227$ ,  $p = .039$ ); how students know about electronic resources ( $r = .586$ ,  $n=227$ ,  $p < .000$ ); social network used ( $r = .388$ ,  $n=227$ ,  $p < .000$ ); settings of access to the Internet ( $r = .345$ ,  $n=227$ ,  $p < .000$ ); areas of accessibility of Internet on campus ( $r = .241$ ,  $n=227$ ,  $p < .000$ ); frequency of access to the Internet per month ( $r = .158$ ,  $n=227$ ,  $p = .017$ ); number of hours spent on Internet per week ( $r = .236$ ,  $n=227$ ,  $p < .000$ ); problems encountered when using Internet on campus ( $r = .233$ ,  $n=227$ ,  $p < .000$ ); perceived biggest problems in using Internet ( $r = .211$ ,  $n=227$ ,  $p = .001$ ); learning activities performed in e-learning system ( $r = .375$ ,  $n=227$ ,  $p < .000$ ); the perception of the evaluation done on e-learning platform ( $r = .149$ ,  $n=227$ ,  $p = .025$ ).

#### 4.4.2.8 Social networking sites used by the nursing students

The findings showed that nursing used social networking sites such as Facebook, Twitter, Student Village, WhatsApp, Skype and Myspace. Of 227 nursing students, the majority, 85.9% (n=195), reported using Facebook; 29.5% (n=67) used Twitter; 19.8% (n=45) used Student Village; 15.0% (n=34) used others such WhatsApp and Skype; 8.4% (n=19) used MySpace (Figure 4-7).



**Figure 4-7: Social networking sites used by the nursing students (n=227)**

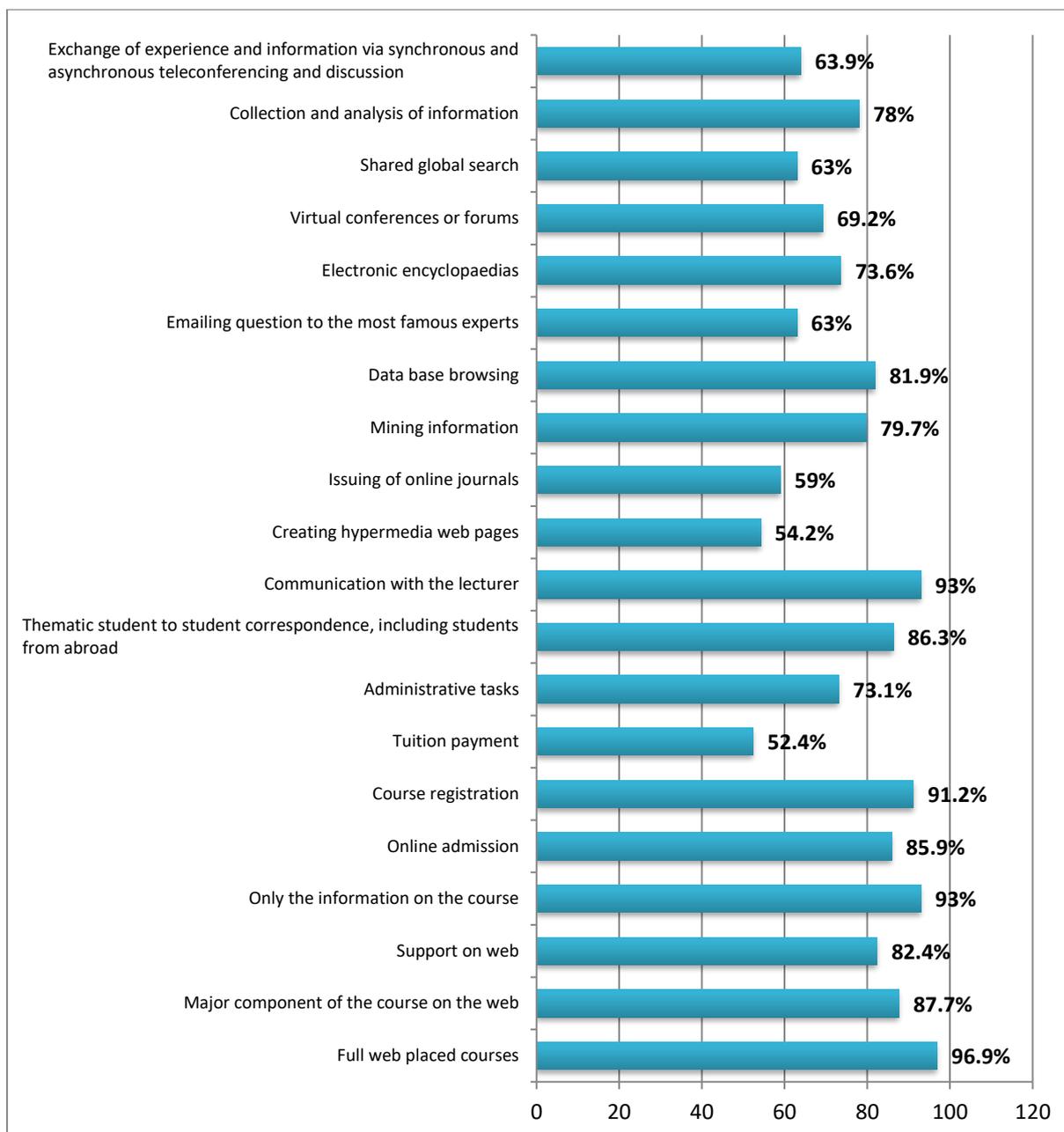
A Pearson correlation was run to determine the relationship between the social network used and different variables. There were significant relationships with the following variables: Gender ( $r = -.187$ ,  $n=227$ ,  $p = .005$ ); perceived level of competence of using computers ( $r = .132$ ,  $n=227$ ,  $p = .048$ ); perceived ability to use Internet ( $r = .200$ ,  $n=227$ ,  $p = .002$ ); how students know about electronic resources ( $r = .351$ ,  $n=227$ ,  $p < .000$ ); search engines used ( $r = .388$ ,  $n=227$ ,  $p < .000$ ); settings of accessibility of Internet ( $r = .342$ ,  $n=227$ ,  $p < .000$ ); areas of accessibility of Internet on campus ( $r = .218$ ,  $n=227$ ,  $p = .001$ ); number of hours spent on Internet ( $r = .178$ ,  $n=227$ ,  $p = .007$ ); problems encountered in using Internet on campus ( $r = .276$ ,  $n=227$ ,  $p < .000$ ); perceived biggest problem in using Internet ( $r = .203$ ,  $n=227$ ,  $p = .002$ ); and learning activities performed in e-learning ( $r = .303$ ,  $n=227$ ,  $p < .000$ ).

#### 4.4.2.9 Academic-related activities usually done by respondents accessing the internet

The findings for academic-related activities usually done by respondents when accessing the internet showed that of 227 nursing students, 96.9% (n=220), used the internet to access full web-placed courses, 93.0% (n=211) for communication with their lecturers, 93.0% (n=211)

only for the information on the course, 91.2% (n=207) for course registration, 87.7% (n=199) for major components of the course on the web, 86.3% (n=196) for thematic student-to-student correspondence, including students from abroad, 85.9% (n=195) for online admission, 82.4% (n=187) for support on web, 81.9% (n=186) for database browsing, 79.7% (n=181) for mining information, 78.0% (n=177) for collection and analysis of information, 73.6% (n=167) for electronic encyclopaedias, 73.1% (n=166) for administrative tasks, 69.2% (n=157) for virtual conferences or forums, 63.9% (n=145) for exchange of experience and information via synchronous and asynchronous teleconferencing and discussion, 63.0% (n=143) for shared global search, 63.0% (n=143) for emailing questions to the most famous experts, 59.0% (n=134) for issuing of online journals, 54.2% (n=123) for creating hypermedia web pages, 52.4% (n=119) for tuition payment (Figure 4-8).

However, the findings indicate that the frequency of doing the activities listed in Figure 4-8 varied considerably, as indicated in the table below. On a Likert scale, for those who reported using the Internet for various activities, interpreted by frequency, the findings were as follows: Of the 96.9% (n=220) who used the internet to access full web-placed courses: 36.1% (n=82) reported doing it sometimes, 31.3 (n=71) said always, and 29.5% (n=67) said very often. Of the 211 (93%) who reported using the internet for communication with their lecturers: 40.5(n=92) had done so sometimes, 29.1% (n=66) had done so very often, and 23% (n=53) had done so always. Of the 93.0% (n=211) who used the internet only for information on the course, 37.9% (n=86) had done so sometimes, 31.3% (n=71) had done so very often and 23.8% (n=54) had done so always. Of the 91.2% (n=207) who reported using the internet for course registration, 42.7% (n=97) had done so sometimes, 26.9% (n=61) had done so always, and 21.6% (n=49) had done so very often.



**Figure 4-8: Academic-related activities when accessing the internet (n=227)**

#### 4.4.2.10 Academic-related activities, by frequency, of respondents accessing the internet

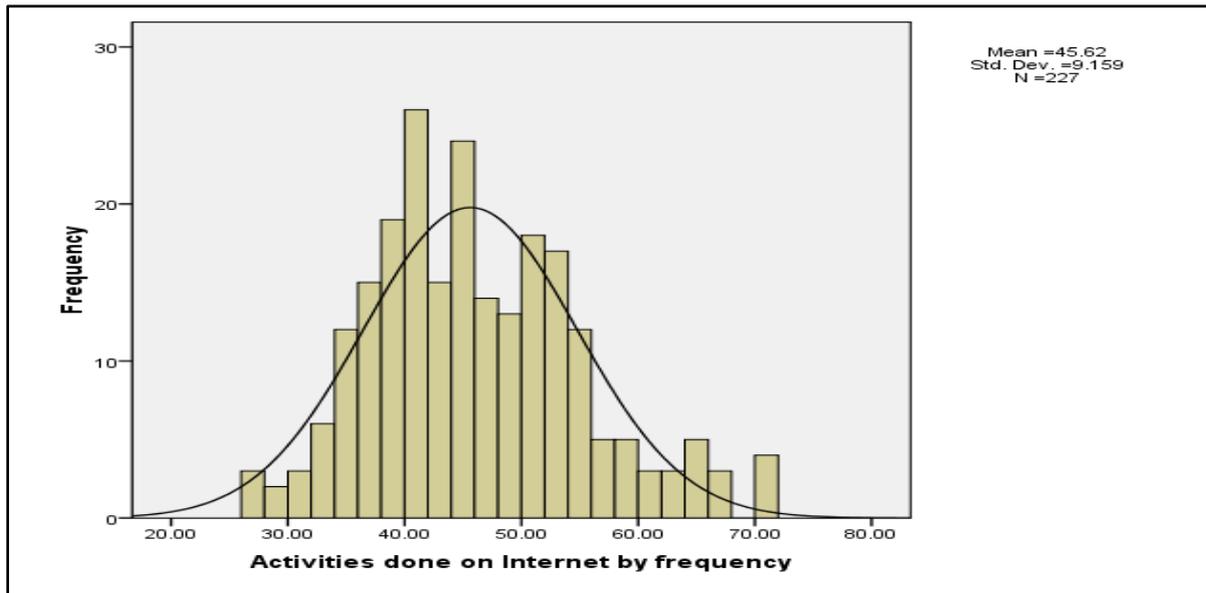
Of the 87.7% (n=199) of respondents who used the internet to access major components of the course on the web: 33.5% (n=76) had done so sometimes, 30.4% (n=69) had done so always and 23.8% (n=54) had done so very often. Of the 86.3% (n=196) who accessed the internet for thematic student-to-student correspondence, including students from abroad, 44.9% (n=102) had done so sometimes, 26.9% (n=61) had done so very often and 14.5% (n=33) had done so always. Of the 85.9% (n=195) who used the internet for online admission, 44.1% (n=100) had

done so sometimes, 22.5% (n=51) had done so very often and 19.4% (n=44) had done so always. Of 82.4% (n=187) who reported having used the internet to get support on the web: [36.6% (n=83) had done so sometimes, 28.6% (n=65) had done so always and 17.2% (n=39) had done so very often]. Of 81.9% (n=186) who reported accessing the internet for database browsing: [40.1% (n=91) had done so sometimes, 23.8% (n=54) had done so very often and 18.1% (n=41) had done so always.

**Table 4-5: Academic activities, by frequency, of respondents when on the Internet (n=227)**

Types of Internet usage	Always		Very often		Sometimes		Never	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Fully Web-placed courses	71	31.3	67	29.5	82	36.1	7	3.1
Major component of the course on the web	69	30.4	54	23.8	76	33.5	28	12.3
Support on the web	65	28.6	39	17.2	83	36.6	40	17.6
Only the information on the course	54	23.8	71	31.3	86	37.9	16	7.0
Online admission	44	19.4	51	22.5	100	44.1	32	14.1
Course registration	61	26.9	49	21.6	97	42.7	20	8.8
Tuition payment	14	6.2	25	11.0	80	35.2	108	47.6
Administrative tasks	19	8.4	44	19.4	103	45.4	61	26.9
Thematic student to student correspondence, including students from abroad	33	14.5	61	26.9	102	44.9	31	13.7
Communication with the lecturer	53	23.3	66	29.1	92	40.5	16	7.0
Creating hypermedia web pages	20	8.8	28	12.3	75	33.0	104	45.8
issuing of online journals	26	11.5	34	15.0	74	32.6	93	41.0
Mining information	31	13.7	45	19.8	105	46.3	46	20.3
Database browsing	41	18.1	54	23.8	91	40.1	41	18.1
Electronic encyclopaedias	30	13.2	41	18.1	96	42.3	60	26.4
Emailing question to the most famous experts	11	4.8	41	18.1	91	40.1	84	37.0
Virtual conferences or forums	18	7.9	21	9.3	118	52.0	70	30.8
Shared global search	27	11.9	24	10.6	114	50.2	62	27.3
collection and analysis of information	33	14.5	42	18.5	102	44.9	50	22.0
Exchange of experience and information via synchronous and asynchronous teleconferencing and discussion list	23	10.1	27	11.9	95	41.9	82	36.1

Overall use of the internet by activities listed above when nursing students accessed the internet was categorised into 20 items and the score was calculated. A Likert scale was used and the responses range from 1 to 4 (1=never; 2=sometimes; 3=very often and 4=always). The minimum score was 26 and the maximum score was 70. Higher score indicated higher utilisation of the internet for many activities, and lower score indicated low utilisation of the internet. The mean of response score was 45.621, the median was 45 and the standard deviation was 9.159 (Figure 4-9). An average of 70.9% had a score of 50, which indicates a relatively high utilisation of the internet for academic-related activities.



**Figure 4-9: Histogram of overall Internet activities of nursing students by frequency (n=227)**

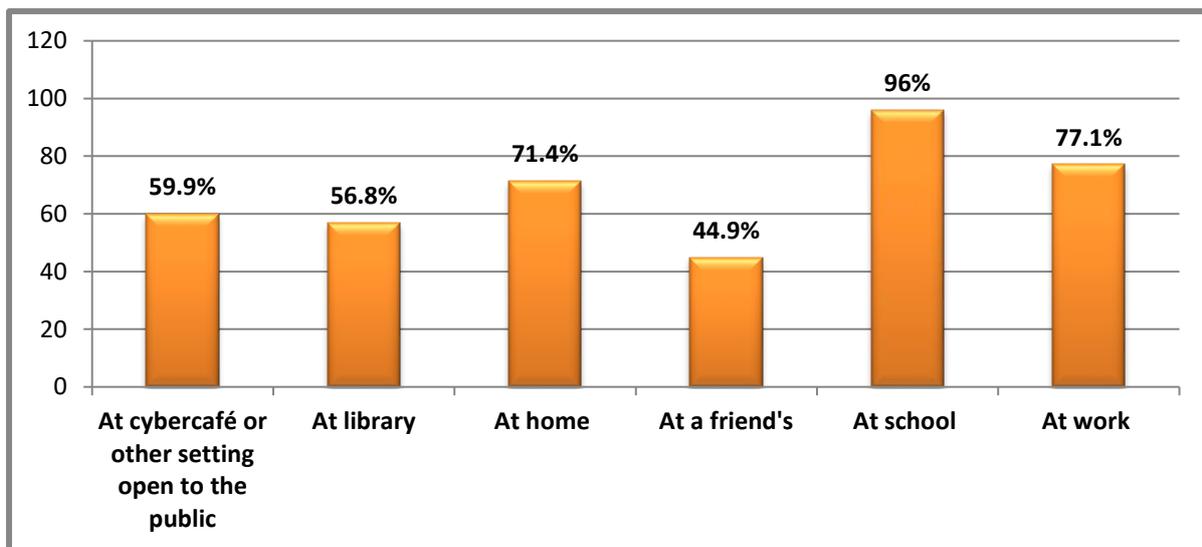
A Pearson correlation was run to determine the relationship between academic activities by frequency done by the respondents when on the internet and different variables. There were significant relationships with the following variables: age of the participants ( $r = -.157$ ,  $n = 227$ ,  $p = .018$ ); perceived level of using computers ( $r = .140$ ,  $n = 227$ ,  $p = .035$ ); perceived ability to use the internet ( $r = -.146$ ,  $n = 227$ ,  $p = .028$ ); how participants know about electronic resources ( $r = .203$ ,  $n = 227$ ,  $p = .002$ ); settings of access to the Internet ( $r = .142$ ,  $n = 227$ ,  $p = .033$ ); frequency of access to the internet per month ( $r = .140$ ,  $n = 227$ ,  $p = .035$ ); number of hours spent on the internet per week ( $r = .244$ ,  $n = 227$ ,  $p < .000$ ); perceived need of orientation in ICT ( $r = -.226$ ,  $n = 227$ ,  $p = .001$ ); perceptions on the content in e-learning ( $r = -.161$ ,  $n = 227$ ,  $p = .015$ ); perceptions on the delivery of the content in e-learning ( $r = -.172$ ,  $n = 227$ ,  $p = .010$ ), perceptions on the outcome of e-learning ( $r = -.145$ ,  $n = 227$ ,  $p = .029$ ); perceptions on the structure of e-learning ( $r = -.150$ ,  $n = 227$ ,  $p = .024$ ), and overall perceptions on the use of e-learning ( $r = -.150$ ,  $n = 227$ ,  $p = .024$ ).

#### **4.4.3 The accessibility of Internet resources**

This section covers the settings of access to the internet, settings frequently used, and areas of access to the internet both on campus and of campus.

#### 4.4.3.1 Settings used by nursing students for access to Internet services

The findings showed that nursing students accessed Internet services from various settings such as cybercafés or other settings open to the public, from the library, at home, at a friend's, at school and at work. Of 227 nursing students, 96.0% (n=218), accessed Internet services at school, 77.1% (n=175) accessed Internet services at work; 71.4% (n=162) accessed Internet services at home, 59.9% (n=136) accessed Internet services at the cybercafé or other setting open to the public; 56.8% (n=129) accessed Internet services at the library; 44.9% (n=102) accessed Internet services at friends (Figure 4-10).

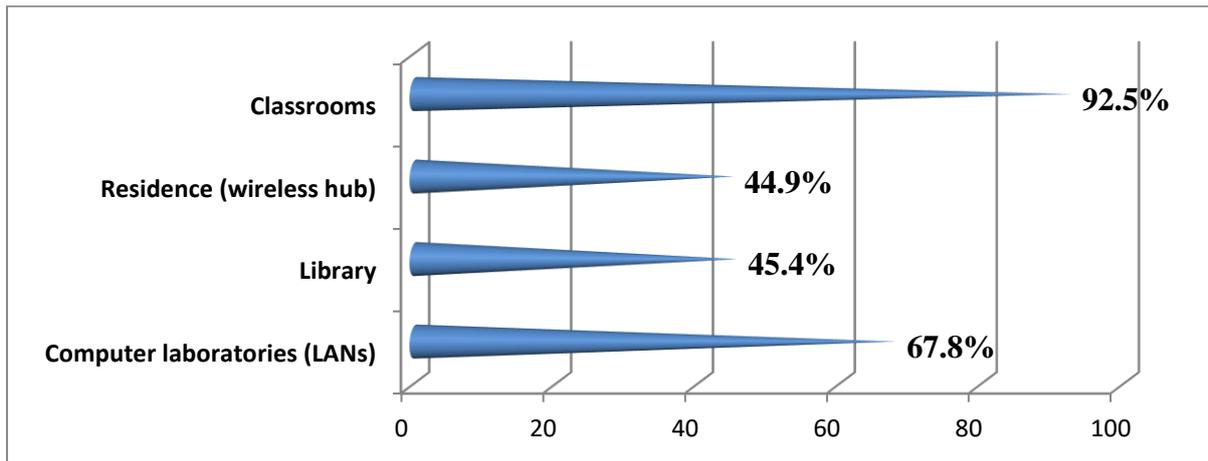


**Figure 4-10: Settings accessed for Internet services by nursing students (n=227)**

A Pearson correlation was run to determine the relationship between internet access settings used by nursing students and various variables. There were significant relationships with the following variables: campus of the participants ( $r = .216$ ,  $n=227$ ,  $p = .001$ ); how students are informed about electronic resources ( $r = .310$ ,  $n=227$ ,  $p < .000$ ); search engines used ( $r = .345$ ,  $n=227$ ,  $p < .000$ ); social network used ( $r = .342$ ,  $n=227$ ,  $P < .000$ ); frequency of activities done on the internet ( $r = .142$ ,  $n=227$ ,  $p = .033$ ); Internet access locations on campus ( $r = .527$ ,  $n=227$ ,  $p < .000$ ); frequency of access to the internet per month ( $r = .147$ ,  $n=227$ ,  $p = .027$ ); Number of hours spent on the internet per week ( $r = .152$ ,  $n=227$ ,  $p = .022$ ); problems encountered in using the internet on campus ( $r = .143$ ,  $n=227$ ,  $p = .031$ ); and learning activities performed in the e-learning system ( $r = .352$ ,  $n=227$ ,  $p < .000$ ).

#### 4.4.3.2 Internet access locations on campus

The findings showed that nursing students on campus accessed the internet from classrooms, Residence (Wireless hub), library, and computer laboratories. Of 227 participants, the majority, 92.5% (n=210) accessed the internet while on campus from classrooms; 67.8% (n=154) from the computer laboratories (LANs); 45.4% (n=103) from the library; and 44.9% (n=102) from the residence (wireless hub) (Figure 4-11).



**Figure 4-11: Usage by nursing students of Internet access locations on campus**

A Pearson correlation was run to determine the relationship between the internet access locations on campus used by nursing students and various variables. There were significant relationships with the following variables: campus ( $r = .200$ ,  $n = 227$ ,  $p = .002$ ); competence level in using the internet ( $r = .133$ ,  $n = 227$ ,  $p = .046$ ); how nursing students know about electronic resources ( $r = .248$ ,  $n = 227$ ,  $p < .000$ ); search engines used ( $r = .241$ ,  $n = 227$ ,  $p < .000$ ); social network website used ( $r = .218$ ,  $n = 227$ ,  $p = .001$ ); settings of access of Internet services ( $r = .527$ ,  $n = 227$ ,  $p < .000$ ); frequency of access to the internet per month ( $r = .290$ ,  $n = 227$ ,  $p < .000$ ); number of hours spent on the internet per week ( $r = .240$ ,  $n = 227$ ,  $p < .000$ ); perceived need of orientation in specific areas ( $r = .182$ ,  $n = 227$ ,  $p = .006$ ), and learning activities performed in e-learning ( $r = .370$ ,  $n = 227$ ,  $p < .000$ ).

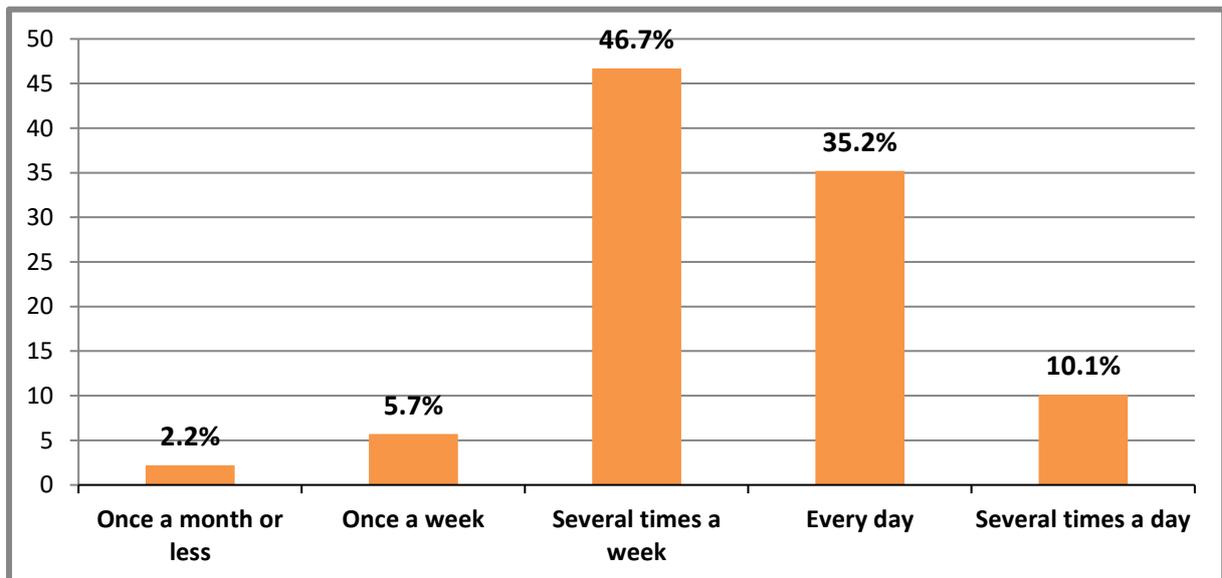
#### 4.4.3.3 Accessibility of the internet off campus by nursing students

The findings showed that out of 227 nursing students, 90.3% (205) had internet access off-campus, while 9.7% reported that they did have internet access when they were off-campus.

A Pearson correlation was run to determine the relationship between off-campus internet access by nursing students and various variables. There were significant relationships with the following variables: campus ( $r = .202$ ,  $n = 227$ ,  $p = .002$ ); perceived competence level in using computers ( $r = .266$ ,  $n = 227$ ,  $p < .000$ ), and perceptions on the content used in e-learning ( $r = -.133$ ,  $n = 227$ ,  $p = .046$ ).

#### 4.4.3.4 Frequency of access to the internet per month by nursing students

The findings showed that differences in frequency of access varied. Of 227 participants, 46.7% ( $n = 106$ ) reported accessing the internet Several times a week; 35.2% ( $n = 80$ ) reported accessing the internet every day; 10.1% ( $n = 23$ ) reported accessing the internet several times a day; 5.7% ( $n = 13$ ) reported accessing the internet once a week; 2.2% ( $n = 5$ ) reported accessing the internet once a month or less (Figure 4-12).

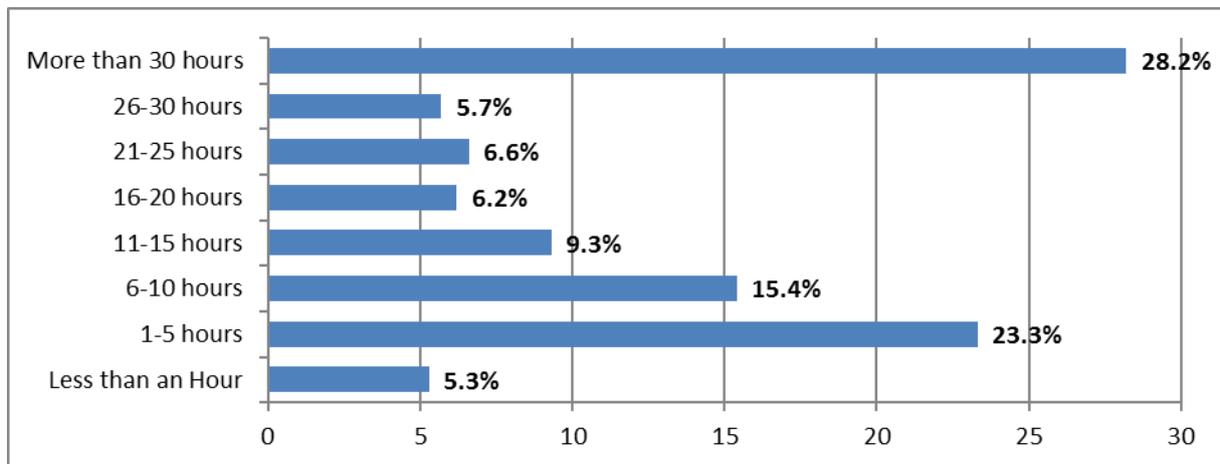


**Figure 4-12: Frequency of internet access by nursing students (n=227)**

A Pearson correlation was run to determine the relationship between the frequency of access to the internet per month and various variables. There were significant relationships with the following variables: perceived level of competence in using the internet ( $r = .183$ ,  $n = 227$ ,  $p = .006$ ); perceived ability to use the internet ( $r = -.230$ ,  $n = 227$ ,  $p < .000$ ); search engines used ( $r = .158$ ,  $n = 227$ ,  $p = .017$ ); frequency of activities done on the internet ( $r = .140$ ,  $n = 227$ ,  $p = .035$ ); settings of access to Internet services ( $r = .147$ ;  $N = 227$ ,  $p = .027$ ), Internet access locations on campus ( $r = .290$ ,  $n = 227$ ,  $p < .000$ ); and number of hours spent on the internet per week ( $r = .453$ ,  $n = 227$ ,  $p < .000$ ).

#### 4.4.3.5 Number of hours spent on Internet per student per week

The findings showed that nursing student spent differing numbers of hours per week on the internet. A relatively small percentage 28.2% (n=64) reported spending more than 30 hours per week; 23.3% (n=53) reported spending between 1-5 hours per week; 15.4% (n=35) reported spending between 6 and 10 hours per week; 9.3% (n=21) reported spending between 11-15 hours per week; 6.6% (n=15) reported spending between 21-25 hours per week; 6.2% (n=14) reported spending between 16-20 hours per week; 5.7% (n=13) reported spending between 26-30 hours, and 5.3% (n=12) reported spending less than an hour per week (Figure 4-13).

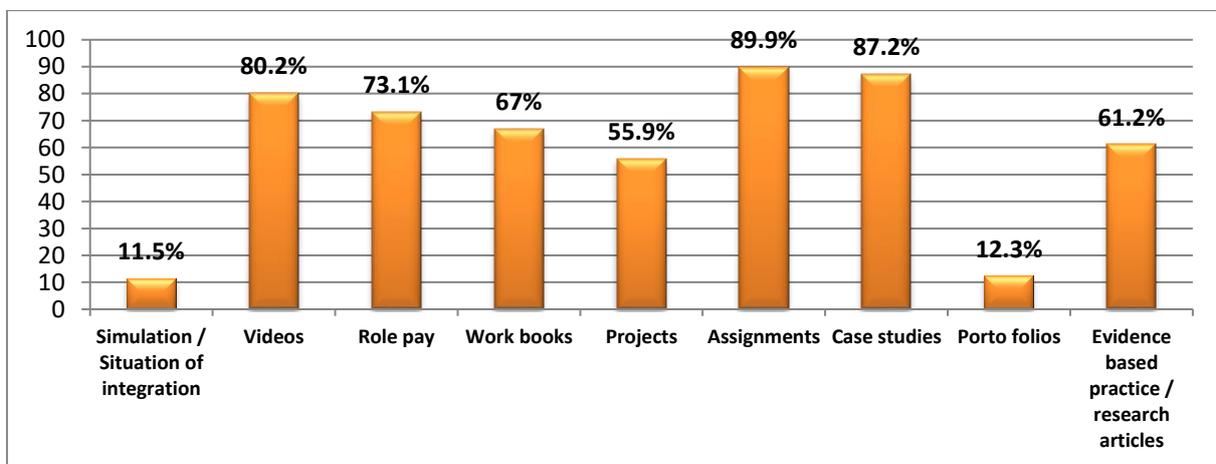


**Figure 4-13: Number of hours spent on Internet by nursing students per student per week**

A Pearson correlation was run to determine the relationship between the number of hours nursing students spent on the internet per week, and various variables. There were significant relationships with the following variables: year of study of the participants ( $r = -.230$ ,  $n=227$ ,  $p < .000$ ); perceived ability to use the internet ( $r = -.199$ ,  $n=227$ ,  $p = .003$ , how participants know about electronic resources ( $r = .265$ ,  $n=227$ ,  $p < .000$ ); search engine used ( $r = .236$ ,  $n=227$ ,  $p < .000$ ), social networks used ( $r = .178$ ,  $n=227$ ,  $p = .007$ ), frequency of activities done on the internet ( $r = .244$ ,  $n=227$ ,  $p < .000$ ), settings of access to the internet ( $r = .152$ ,  $n=227$ ,  $p = .022$ ), Internet access location on campus ( $r = .240$ ,  $n=227$ ,  $p < .000$ ); frequency of access to the Internet per month ( $r = .453$ ,  $n=227$ ,  $p < .000$ ); perceived biggest problems in using the internet ( $r = .185$ ,  $n=227$ ,  $p = .005$ ), and learning activities performed in e-learning ( $r = .165$ ,  $n=227$ ,  $p = .013$ ).

#### 4.4.4 Types of learning activities performed by participants in the e-learning system

The findings showed that nursing students performed a number of activities in the e-learning system, such as watching videos, doing role play, work books, projects, assignments, case studies, portfolios, evidence-based practice/ research articles and simulation/situation of integration. Of 227 nursing students, 89.9% (n=204) reported assignments, 87.2% (n=198) reported case studies, 80.2% (n=182) reported videos, 73.1% (n=166) reported role pay, 67.0% (n=152) reported work books, 61.2% (n=139) reported evidence based practice/ research articles, 55.9% (n=127) reported projects, 12.3% (n=28) reported portfolios, and 11.5% (n=26) reported simulation/situation of integration (Figure 4-14).



**Figure 4-14: Learning activities performed by participants in e-learning system (n=227)**

A Pearson's correlation was run to assess the relationship between learning activities performed in e-learning and various variables. There were statistically significant relationships between the following variables: year of study ( $r = -.136$ ,  $n=227$ ,  $p = .041$ ); how participant knows about electronic resources ( $r = .453$ ,  $n=227$ ,  $p < .000$ ), search engines used ( $r = .375$ ,  $n=227$ ,  $p < .000$ ); social network sites used ( $r = .303$ ,  $n=227$ ,  $p < .000$ ); settings of access to the internet ( $r = .352$ ,  $n=227$ ,  $p < .000$ ); areas of accessibility of the internet on campus ( $r = .370$ ,  $n=227$ ,  $p < .000$ ); number of hours spent on the internet per week ( $r = .165$ ,  $n=227$ ,  $p = .013$ ); problems encountered while using the internet on campus ( $r = .181$ ,  $n=227$ ,  $p = .006$ ); biggest problems in using the internet ( $r = .235$ ,  $n=227$ ,  $p < .000$ ), perceived need of orientation in specific areas in ICT ( $r = .253$ ,  $n=227$ ,  $p < .000$ ), and perception of the outcome from e-learning ( $r = .131$ ,  $n=227$ ,  $p = .049$ ).

#### 4.4.5 Factors influencing effectiveness use of the Internet as an academic tool

The findings showed that a number of factors influence effective use of the internet such as constraints and problems.

##### 4.4.5.1 Constraints encountered by students in using the internet facilities on campus

The findings showed that a number of constraints were encountered by nursing students using the internet, such as not enough computers, very slow Internet connection, very little or no training in the use of Internet facilities, and being restricted to certain websites. Of 227 participants, an average percentage, 63.0% (n=143), reported a very slow Internet connection (takes too long to load pages), 35.2% (n=80) reported restricted access to certain networking sites; 22.5% (n=51) reported very few internet-connected computers; 21.1% (n=48) reported that very little training in the use of the Internet facilities is offered to students, and 4.4% (n=10) reported no training on how to use Internet facilities.

**Table 4-6: Constraints encountered by students using Internet facilities on campus (n=227)**

	YES		NO	
	Freq.	%	Freq.	%
Very few Internet computers	51	22.5	176	77.5
Very slow Internet connection (takes too long to load pages)-	143	63.0	84	37.0
Very little training in the use of the Internet facilities is offered to students	48	21.1	179	78.9
No training on how to use Internet facilities	10	4.4	217	95.6
Restricted access to certain networking sites	80	35.2	147	64.8

A Pearson correlation was run to determine the relationship between constraints encountered by the students using the internet facilities on campus and other variables. There were significant relationships with the following variables: campus ( $r = -.260$ ,  $n=227$ ,  $p < .000$ ); year of study ( $r = -.142$ ,  $n=227$ ,  $p = .032$ ); gender ( $r = -.159$ ,  $n=227$ ,  $p = .016$ ); how nursing students know about electronic resources ( $r = .256$ ,  $n=227$ ,  $p < .000$ ); search engines used by nursing students ( $r = .233$ ,  $n=227$ ,  $p < .000$ ); social networking sites used by nursing students ( $r = .276$ ,  $n=227$ ,  $p < .000$ ); settings of access to Internet services by nursing students ( $r = .143$ ,  $n=227$ ,  $p = .031$ ); perceived biggest problems in using the internet by nursing students ( $r = .583$ ,  $n=227$ ,  $p < .000$ ); and perceived need for orientation in specific areas ( $r = .217$ ,  $n=227$ ,  $p = .001$ ); perception of the content used in e-learning ( $r = -.262$ ,  $n=227$ ,  $p < .000$ ); perception of the delivery of courses used in e-learning ( $r = -.277$ ,  $n=227$ ,  $p < .000$ ); perception of the services provided in e-learning ( $r = -.263$ ,  $n=227$ ,  $p < .000$ ); perception of the outcomes from e-learning ( $r = -.228$ ,  $n=227$ ,  $p = .001$ ); perception of the structure of e-learning ( $r = -.225$ ,  $n=227$ ,  $p = .001$ ); perception

of the evaluation done in e-learning platform ( $r = -.218$ ,  $n=227$ ,  $p = .001$ ); learning activities performed in e-learning ( $r = .181$ ,  $n=227$ ,  $p=.006$ ), and overall perception by the nursing students of the use of e-learning ( $r = -.250$ ,  $n=227$ ,  $p < .000$ ).

#### 4.4.5.2 Perceived biggest problems in use of Internet by nursing students

The findings indicated that nursing students reported a number of problems in using the internet. Of 227 participants, an average percentage, 58.6% ( $n=133$ ), reported encountering sites that required payment to access information; 49.8% ( $n=113$ ) reported sites that required participants to register with them; 30.4% ( $n=69$ ) reported that it took too long to view/download pages; 30.4% ( $n=69$ ) reported sites that were not compatible with all browsers; 27.3% ( $n=62$ ) reported that it cost too much; 23.8% ( $n=54$ ) reported having problems with their browsers (e.g. freezing up, poor interface, getting disconnected, timing out); 23.3% ( $n=53$ ) reported not being able to find the information they were looking for; 22.9% ( $n=52$ ) reported advertising banners that took too long to load; 21.6% ( $n=49$ ) reported encountering pages with bad html; 21.1% ( $n=48$ ) reported encountering links that did not work; 18.1% ( $n=41$ ) reported sites with too many graphics or useless graphics; 17.6% ( $n=40$ ) reported too many "junk" sites; 14.1% ( $n=32$ ) reported getting errors from pages that use java, JavaScript, ActiveX; 13.2% ( $n=30$ ) reported not being able to efficiently organize the information they gather; 13.2% ( $n=30$ ) reported not being able to return to a page they once visited; 12.8% ( $n=29$ ) reported not being able to find a page they know is out there; 10.6% ( $n=24$ ) reported not being able to visualize where they have been and where they can go; 7.5% ( $n=17$ ) reported not being able to determine where they were ('lost in hyperspace' problem) (Figure 4-15).

A Pearson correlation was run to determine the relationship between the biggest problems perceived by nursing students and other variables. There were statistically significant relationships between the following variables: campus ( $r = -.311$ ,  $n=227$ ,  $p < .000$ ); gender ( $r = -.215$ ,  $n=227$ ,  $p = .001$ ); how nursing students know about electronic resources ( $r = .140$ ,  $n=227$ ,  $p = .036$ ), search engines used ( $r = .211$ ,  $n=227$ ,  $p = .001$ ), social network used ( $r = .203$ ,  $n=227$ ,  $p = .002$ ); number of hours spent on the internet per week ( $r = .185$ ,  $n=227$ ,  $p = .005$ ); problems encountered while using the internet on campus ( $r = .583$ ,  $n=227$ ,  $p < .000$ ); perceived orientation in specific areas of ICT( $r = .379$ ,  $n=227$ ,  $p < .000$ ); perception of the content used in e-learning ( $r = -.266$ ,  $n=227$ ,  $p < .000$ ); perception of the delivery of courses in e-learning ( $r = -.269$ ,  $n=227$ ,  $p < .000$ ); perception of the services provided in e-learning ( $r = -.256$ ,  $n=227$ ,  $p < .000$ ).

.000); perception of the outcomes from e-learning ( $r = -.208$ ,  $n=227$ ,  $p = .002$ ); perception of the structure of e-learning ( $r = -.225$ ,  $n=227$ ,  $p < .001$ ); perception of the evaluation done in e-learning ( $r = -.173$ ,  $n=227$ ,  $p = .009$ ), learning activities performed in e-learning ( $r = .235$ ,  $n=227$ ,  $p < .000$ ), and the overall perception of nursing students on the use of e-learning ( $r = -.244$ ,  $n=227$ ,  $p < .000$ ).

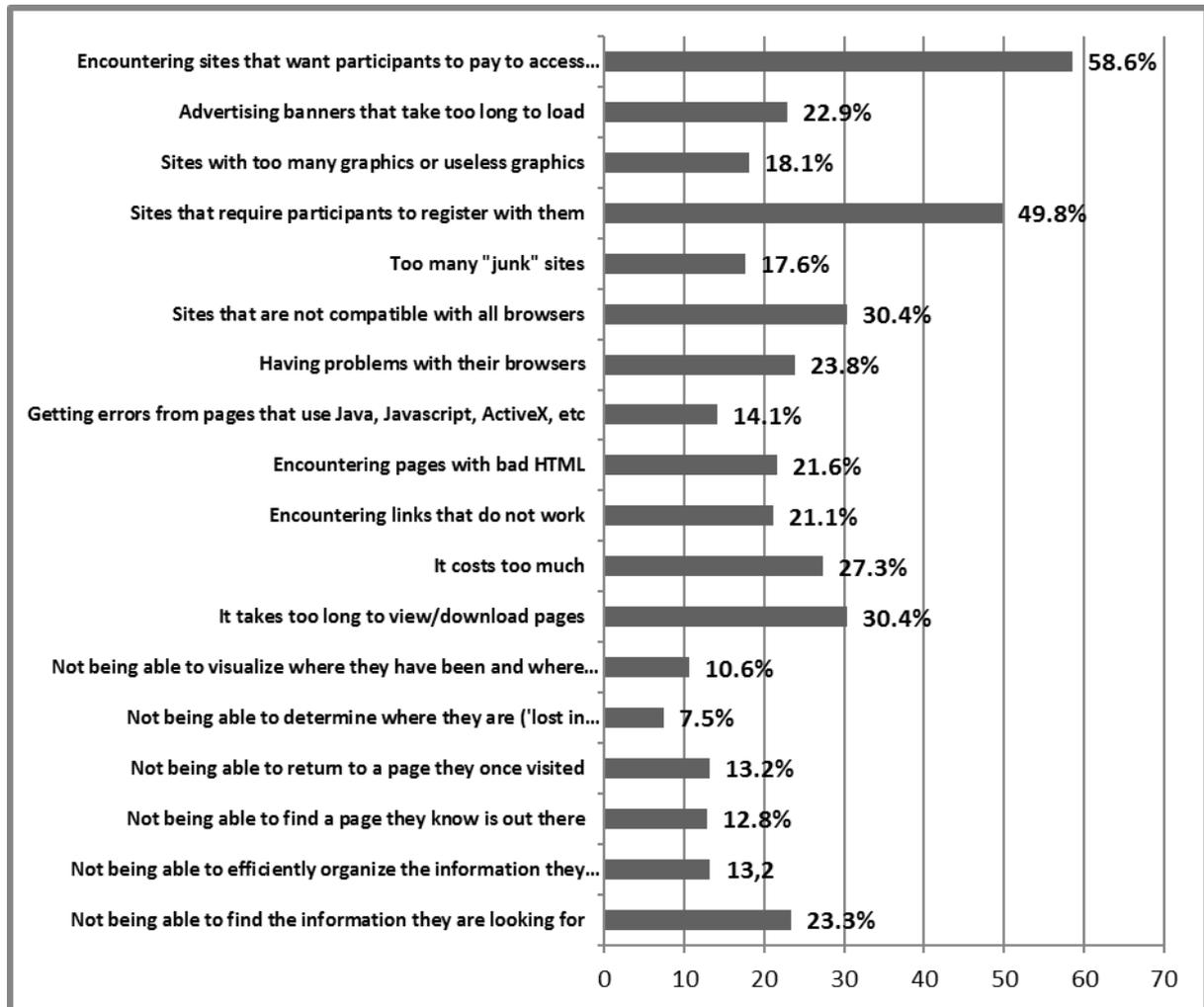


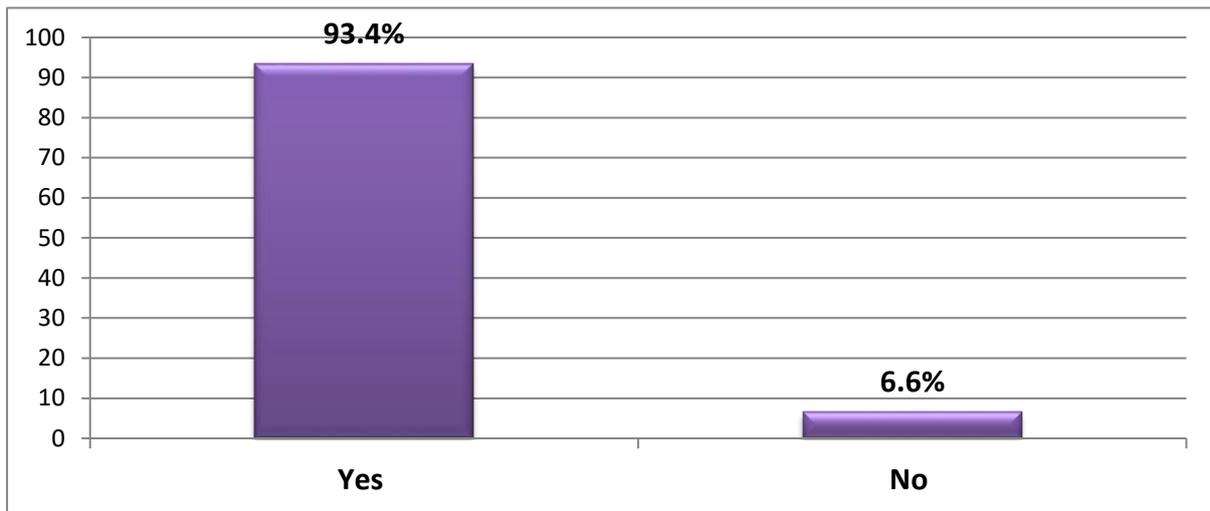
Figure 4-15: Perceived biggest problems in use of Internet by nursing students (n=227)

#### 4.4.6 Perceived need for orientation in ICT and specific areas

##### 4.4.6.1 Perceived need for orientation in ICT

The findings indicated that nursing students perceived a need for training in ICT. Of 227 participants, 93.4% (212) reported that there was a need for orientation in ICT, while only 6.6% (n=15) said there was no need for that orientation (Figure 4-16).

A Pearson correlation was run to determine the relationship between the biggest problems perceived by nursing students and other variables. There were statistically significant relationships between the following variables: year of study ( $r = .181$ ,  $n = 227$ ,  $p = .006$ ); perceived ability to use the Internet ( $r = -.166$ ,  $n = 227$ ,  $p = .012$ ); frequency of activities done on the internet ( $r = -.226$ ,  $n = 227$ ,  $p = .001$ ), and perceived need for specific areas of orientation in ICT ( $r = .425$ ,  $n = 227$ ,  $p < .000$ ).



**Figure 4-16: Perceived need for orientation in ICT (n=227)**

#### 4.4.6.2 Specific areas of orientation in ICT

The findings indicated that nursing students needed orientation in various areas. Of 162 participants, 71.4% ( $n = 162$ ) indicated a need for orientation in using Moodle; 64.8% ( $n = 147$ ) indicated a need for orientation in basic IT skills (Microsoft Word, Excel, PowerPoint, Internet, etc.); 57.7% ( $n = 131$ ) indicated a need for orientation in accessing academic-related materials such as journals, software, etc.; 24.2% ( $n = 55$ ) indicated a need for orientation in using endnote; 16.3% ( $n = 37$ ) indicated a need for orientation using Turnitin.

**Table 4-7: Specific areas of orientation need in ICT (n=227)**

Specific areas of orientation in ICT	Yes		No	
	Freq.	%	Freq.	%
Basic IT skills (Microsoft Word, Excel, PowerPoint, Internet, etc.)	147	64.8	80	35.2
Access academic-related materials such as journals, software etc.	131	57.7	96	42.3
Using Moodle	162	71.4	65	28.6
Using Turnitin	37	16.3	190	83.7
Using Endnote	55	24.2	172	75.8

A Pearson correlation was run to determine the relationship between the biggest problems perceived by nursing students and other variables. There were statistically significant relationships between the following variables: campus ( $r = -.280$ ,  $n=227$ ,  $p < .000$ ), areas of access to the internet on campus ( $r = .182$ ,  $n=227$ ,  $p = .006$ ), problems encountered while using the internet on campus ( $r = .217$ ,  $n=227$ ,  $p = .001$ ); biggest problem in using the internet ( $r = .379$ ,  $n=227$ ,  $p < .000$ ); perceived need of orientation in ICT ( $r = .425$ ,  $n=227$ ,  $p < .000$ ); perception of the content used in e-learning ( $r = .145$ ,  $n=227$ ,  $p = .027$ ), perceived outcomes from e-learning ( $r = .146$ ,  $n=227$ ,  $p = .028$ ), and learning activities done on e-learning ( $r = .253$ ,  $n=227$ ,  $p < .000$ ).

**Table 4-8: Correlation between various constructs related to e-learning, and nursing students characteristics (n=227)**

	CPS	YST	HOA	GND	CLC	PAI	KER	SEU	SNU	FADI	SAI	AIC	AIO	FAIM	NHIW	PEIC	BPI	PNOT	SAOT	LAPE
CPS	1	.127	.060	.170*	.239**	-.005	-.194**	-.021	-.058	-.019	.216**	.200**	.202**	-.009	-.115	-.260**	-.311**	-.006	-.280**	.001
YST	.127	1	.001	-.065	.019	-.043	-.332**	-.249**	-.012	-.121	-.069	-.054	.095	-.030	-.230**	-.142*	-.036	.181**	.115	-.136*
HOA	.060	.001	1	-.126	-.036	-.056	-.057	.063	.095	-.157*	-.025	.023	.074	.023	.009	-.020	-.050	-.043	-.007	.029
GND	.170*	-.065	-.126	1	-.033	.021	.050	-.072	-.187**	-.071	.012	-.008	-.058	-.014	-.015	-.159*	-.215**	.024	-.072	.013
CLC	.239**	.019	-.036	-.033	1	-.302**	.021	.137*	.132*	.140*	.097	.133*	.266**	.183**	.070	-.075	-.100	.015	-.008	.073
PAI	-.005	-.043	-.056	.021	-.302**	1	-.110	-.082	-.200**	-.146*	-.004	-.081	-.097	-.230**	-.199**	.082	-.003	-.166*	-.114	-.059
KER	-.194**	-.332**	-.057	.050	.021	-.110	1	.586**	.351**	.203**	.310**	.248**	.053	.064	.265**	.256**	.140*	-.095	.121	.453**
SEU	-.021	-.249**	.063	-.072	.137*	-.082	.586**	1	.388**	.123	.345**	.241**	.075	.158*	.236**	.233**	.211**	-.099	.110	.375**
SNU	-.058	-.012	.095	-.187**	.132*	-.200**	.351**	.388**	1	.125	.342**	.218**	.096	.010	.178**	.276**	.203**	-.082	.096	.303**
FADI	-.019	-.121	-.157*	-.071	.140*	-.146*	.203**	.123	.125	1	.142*	.059	.110	.140*	.244**	.026	.113	-.226**	-.028	.046
SAI	.216**	-.069	-.025	.012	.097	-.004	.310**	.345**	.342**	.142*	1	.527**	.118	.147*	.152*	.143*	.092	-.069	.064	.352**
AIC	.200**	-.054	.023	-.008	.133*	-.081	.248**	.241**	.218**	.059	.527**	1	.002	.290**	.240**	.112	.123	.040	.182**	.370**
AIO	.202**	.095	.074	-.058	.266**	-.097	.053	.075	.096	.110	.118	.002	1	-.036	-.090	.050	-.096	-.087	-.099	-.018
FAIM	-.009	-.030	.023	-.014	.183**	-.230**	.064	.158*	.010	.140*	.147*	.290**	-.036	1	.453**	-.092	.058	.081	.061	.033
NHIW	-.115	-.230**	.009	-.015	.070	-.199**	.265**	.236**	.178**	.244**	.152*	.240**	-.090	.453**	1	.037	.185**	-.016	.096	.165*
PEIC	-.260**	-.142*	-.020	-.159*	-.075	.082	.256**	.233**	.276**	.026	.143*	.112	.050	-.092	.037	1	.583**	.110	.217**	.181**
BPI	-.311**	-.036	-.050	-.215**	-.100	-.003	.140*	.211**	.203**	.113	.092	.123	-.096	.058	.185**	.583**	1	.041	.379**	.235**
PNOT	-.006	.181**	-.043	.024	.015	-.166*	-.095	-.099	-.082	-.226**	-.069	.040	-.087	.081	-.016	.110	.041	1	.425**	.006
SAOT	-.280**	.115	-.007	-.072	-.008	-.114	.121	.110	.096	-.028	.064	.182**	-.099	.061	.096	.217**	.379**	.425**	1	.253**
LAPE	.001	-.136*	.029	.013	.073	-.059	.453**	.375**	.303**	.046	.352**	.370**	-.018	.033	.165*	.181**	.235**	.006	.253**	1

\*. Correlation is significant at the .005 level (2-tailed).

\*\* . Correlation is significant at the .001 level (2-tailed).

Note: CPS: Campus; YST: Year of study; HOA: Age; GND: Gender; CLC: Competence level of using computer; PAI: Perceived ability to use the internet; KER: Knowledge about electronic resources; SEU: Search engines used; SNU: Social networking sites used; SAI: Settings of access to the internet; AIC: Areas of accessibility of the internet on campus; AIO: Access to the Internet off campus; FAIM: Frequency of access to the internet; NHIW: Number of hours spent on Internet per week; PEIC: Problems encountered when using the Internet facilities on campus; BPI: Perceived biggest problems in using the internet; PNOT: Perceived need for an orientation in technology; SAOT: specific areas of orientation in technology; LAPE: Learning activities performed in e-learning system; FADI : frequency with activities done on the internet; PCUE: Perception of the content used in e-learning; PDCE: Perception of the delivery of courses used in e-learning; PSPE: Perception of the services provided in e-learning; POFE: perception of the outcomes from e-learning; PSEO: perception of the structure of e-learning; PEDE: Perception of the evaluation done in e-learning platform

## 4.5 FINDINGS FROM QUANTITATIVE DATA SET TWO: NURSE EDUCATOR PARTICIPANTS

### 4.5.1 Sociodemographic characteristics of nurse educators

The findings indicated that 44 nurse educators from three campuses of the selected nursing school in Rwanda responded to the questionnaires. Their sociodemographic characteristics were as follows.

#### 4.5.1.1 Age of the participants

Of 44 nurse educator participants, the minimum age was 27 and the maximum age was 57. The mean age was 34.59 and the standard deviation (S.D) was 7.215 (Figure 4-17).

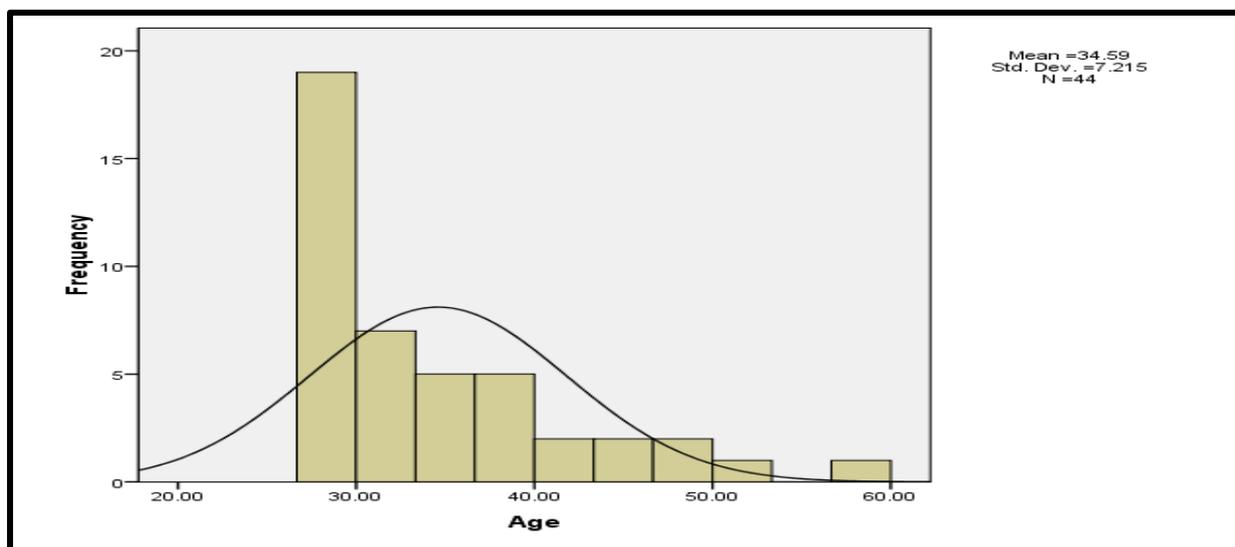


Figure 4-17: Histogram of age of the participants (n=44)

#### 4.5.1.2 Gender of the participants

The majority were female, 68.2% (n=30) and 31.8% were male (n=14).

#### 4.5.1.3 Highest qualification of the participants

Regarding highest qualification of the participants, it was found that 54.5% (n=24) had a bachelor's degree, 22.7% (n=10) had an honour's degree, 18.2% (n=8) had an advanced diploma, and 4.5% (n=2) had a master's degree.

#### 4.5.1.4 Qualification in nursing education

The majority of nurse educators, 70.5% (n=31) did not have a qualification in nursing education; only 29.5% (n=13) reported having a qualification in nursing education.

#### 4.5.1.5 Number of years' working experience

The minimum number of years' working experience was 2 years and the maximum was 15 years. The mean number of years' working experience was 4.91 and the standard deviation (S.D) was 3.139 (Figure 4-18).

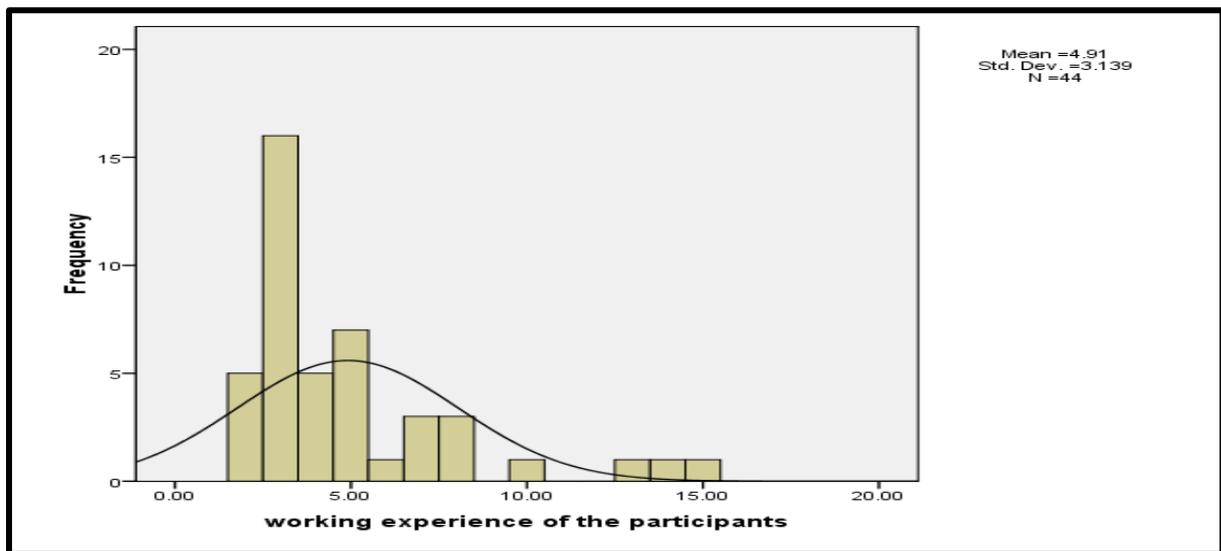


Figure 4-18: Histogram of working experience of the participants (n=44)

Table 4-9: Sociodemographic characteristic of the nurse educators (n=44)

	Variables	Frequency	Percentage
Gender	Males	14	31.8%
	Females	30	68.2%
Age category	27-30 years	19	43.2%
	31-40years	17	38.6%
	41-50 years	6	13.6%
	51-60 years	2	4.5%
Highest qualification	Master's degree	2	4.5%
	Honour's degree	10	22.7%
	Bachelor's degree	24	54.5%
	Diploma	8	18.2%
Qualification in nursing education	YES	13	29.5%
	No	31	70.5%
Number of years of working experience	1 to 3 years	21	47.7%
	4 to 6 years	13	29.5%
	7 years and above	10	22.7%

## 4.5.2 Experience of nurse educators with ICT for teaching

### 4.5.2.1 Shared vision about incorporating ICT in teaching and learning in the school

The findings showed that the majority of the participants, 84.1% (n=34) had the same vision about incorporating ICT in teaching and learning as their colleagues, the head of school and other staff, and only 15.9% (n=7) reported not having the same vision (Figure 4-19).

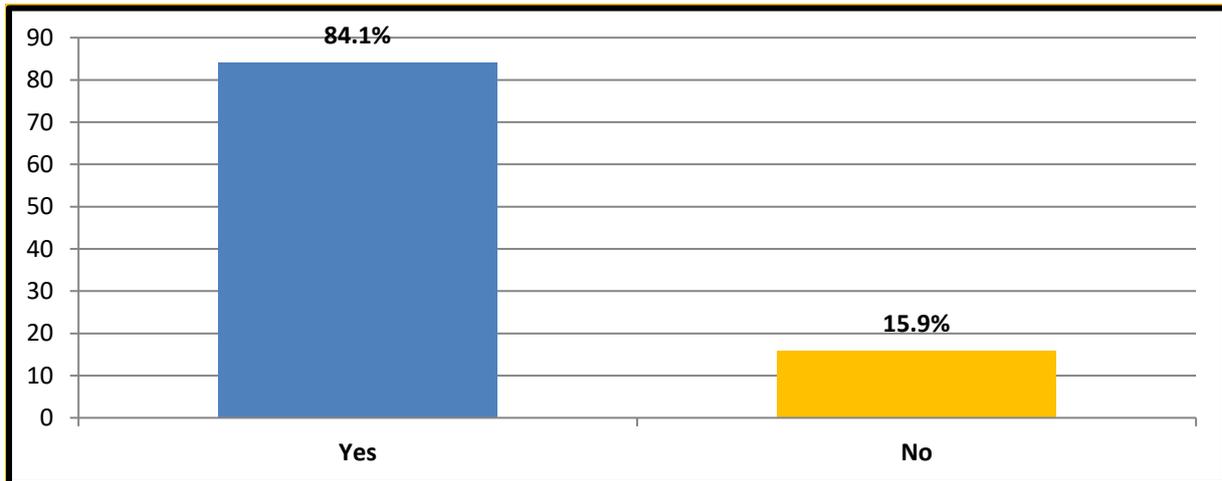


Figure 4-19: Shared vision about integrating ICT in teaching and learning in the school (n=44)

A Spearman's correlation was run to assess the relationship between shared vision about ICT, and various variables. There were statistically significant relationships between the following variables: years of working experience ( $r_s[44] = .335, p = .026$ ); number of hours taught per week ( $r_s[44] = -.331, p = .028$ ); conditions of access to infrastructure for the target classes ( $r_s[44] = .310, p = .041$ ); and obstacles to using ICT in teaching and learning ( $r_s[44] = .438, p = .003$ ).

### 4.5.2.2 Cross-tabulation of age of participants and shared vision about ICT in teaching and learning

Cross-tabulation of age group of the participants and having the same vision about incorporation of ICT in teaching and learning at their school, indicated that 89.5% (n=17) in the 27-30 age group shared the same vision, as did 82.4% (n=14) in the 31-40 age group, 83.3% (n=5) in the 41-50 age group and (50%; n=1) in the 51-60 age group.

**Table 4-10: Cross-tabulation: age of participants and shared vision about ICT incorporation in teaching and learning (n=44)**

		Shared vision about ICT incorporating in teaching and learning at school		
		Yes	No	Total
Age group of participants	27-30 years	17(89.5%)	2(10.5%)	19(100.0%)
	31-40 years	14(82.4%)	3(17.6%)	17(100.0%)
	41-50 years	5(83.3%)	1(16.7%)	6(100.0%)
	51-60 years	1(50.0%)	1(50.0%)	2(100.0%)
Total		37(84.1%)	7(15.9%)	44(100.0%)

#### 4.5.2.3 Cross-tabulation of qualification in nursing education and shared vision about ICT incorporation in teaching and learning

Cross-tabulation of qualification in nursing education and shared vision about ICT incorporation in teaching and learning at the school indicated that all who had a qualification in nursing education shared the same vision 100% (n=13), as did 77.4% (n=24) who did not have a qualification.

**Table 4-11: Cross-tabulation: qualification in nursing education and shared vision about ICT incorporation in teaching and learning (n=44)**

			Shared vision about ICT incorporation in teaching and learning at school		
			Yes	No	Total
Qualification in nursing education	Yes	Freq.	13	0	13
		%	100.0%	.0%	100.0%
	No	Freq.	24	7	31
		%	77.4%	22.6%	100.0%
Total		Freq.	37	7	44
		%	84.1%	15.9%	100.0%

#### 4.5.2.4 Cross-tabulation working experience of the participants and having the same vision about integrating ICT in teaching and learning at their school

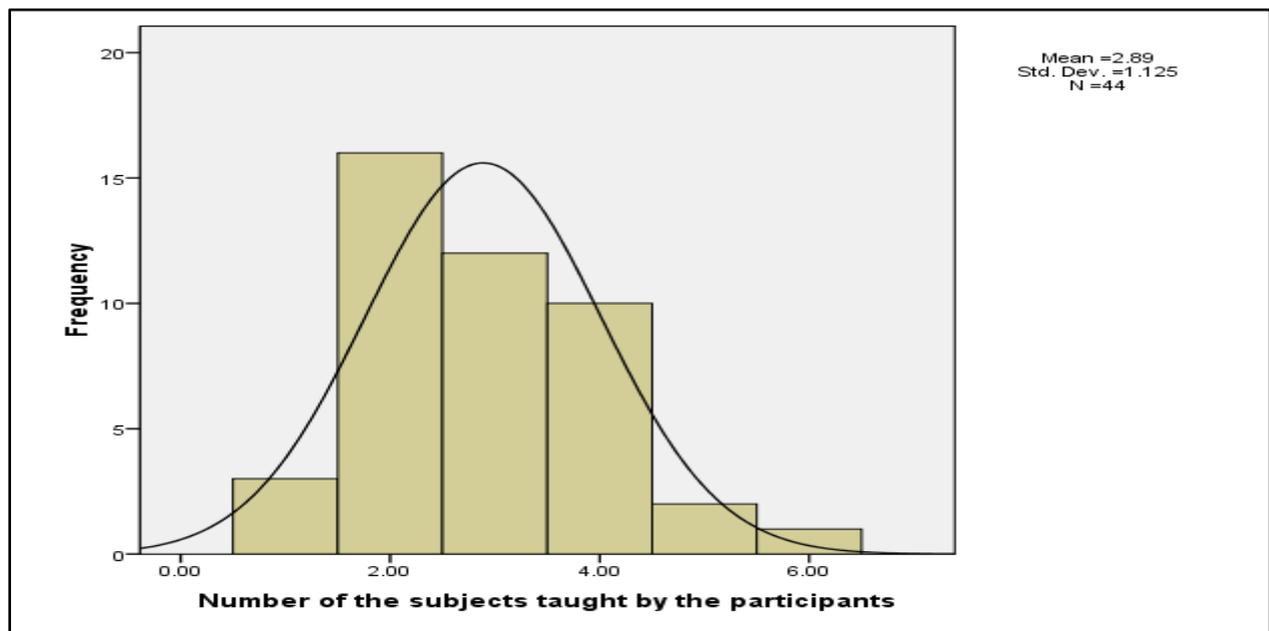
Cross-tabulation of working experience of the participants and having the same vision about ICT incorporation in teaching and learning at their school revealed that 93.9% (n=31) with a working experience between 2-5 years had a shared vision of ICT incorporation in teaching and learning at school, followed by 50% (n=4) with a working experience between 6-10 years, and 66.7% (n=2) with a teaching experience between 11-15 years.

**Table 4-12: Cross-tabulation: working experience of participants and shared vision about ICT incorporation in teaching and learning (n=44)**

		Shared vision about ICT incorporation in teaching and learning at their school		
		Yes	No	Total
Working experience of the participants	Years of experience			
	2-5 years	31(93.9%)	2(6.1%)	33(100.0%)
	6-10 years	4(50.0%)	4(50.0%)	8(100.0%)
	11-15 years	2(66.7%)	1(33.3%)	3(100.0%)
Total		37(84.1%)	7(15.9%)	44(100.0%)

#### 4.5.2.5 Number of subjects taught by the participants

The findings revealed that the minimum number of subjects taught was 1 and the maximum was 6. The mean was 2.886, the median was 3, and the standard deviation was 1.125 (Figure 4-20).



**Figure 4-20: Number of the subjects taught by the participants (n=44)**

A Spearman's correlation was run to assess the relationship between the number of subjects taught by nurse educators and various variables. There were statistically significant relationships between the following variables: campus ( $r_s[44] = -.377, p = .012$ ); gender ( $r_s[44] = -.325, p = .032$ ); positive impact of using ICT on student learning ( $r_s[44] = -.478, p = .001$ ); attitude toward the use of ICT at school ( $r_s[44] = -.419, p = .005$ ).

#### 4.5.2.6 Number of hours per week that participants teach in their target classes

The findings revealed that the minimum number of working hours per week in the target class was four hours and the maximum was seventy hours. The mean was 28.431, the median was 28 and the standard deviation was 11.738 (Figure 4-21).

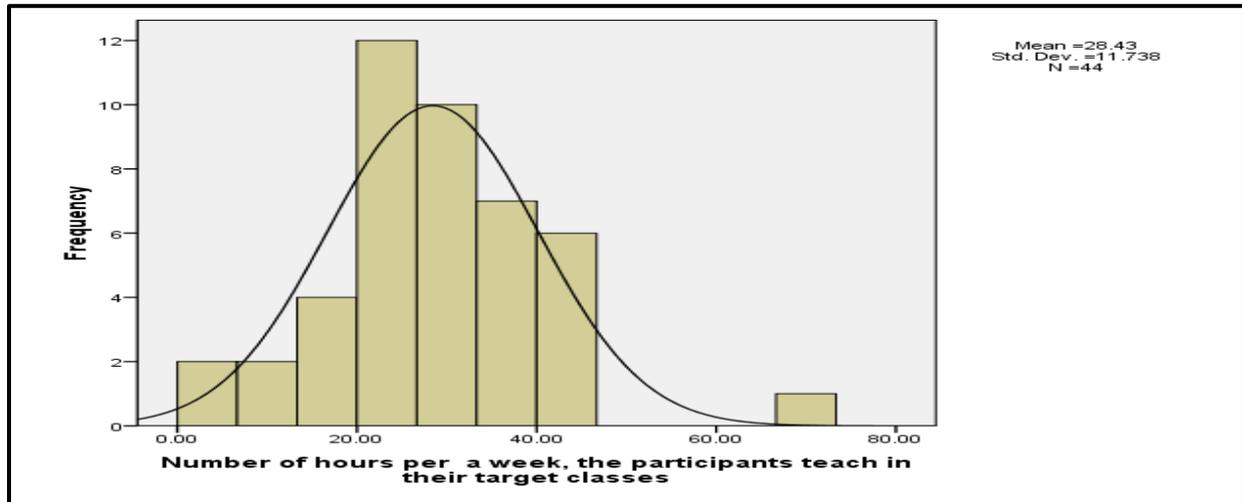


Figure 4-21: Number of hours per week, the participants teaches in their target classes (n=44)

A Spearman's correlation was run to assess the relationship between the number of hours taught by nurse educators per week and various variables. There were statistically significant relationships between the following variables: percentage of time spent using ICT ( $r_s[44] = .355, p = .018$ ), school shared vision about the use of ICT ( $r_s[44] = -.331, p = .028$ ).

#### 4.5.2.7 Using computer and/or Internet to prepare and teach lessons in the last 12 months

Of 44 nurse educators, the majority reported using computer and/or Internet to prepare and teach lessons in the last 12 months: 97.7(n=43) in preparing lessons and 97.7 (n=43) in class teaching in front of/with students (Figure 4-22).

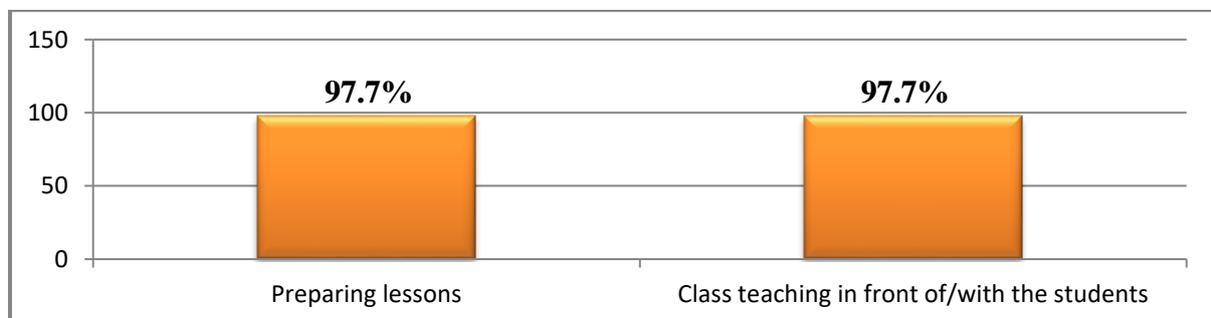
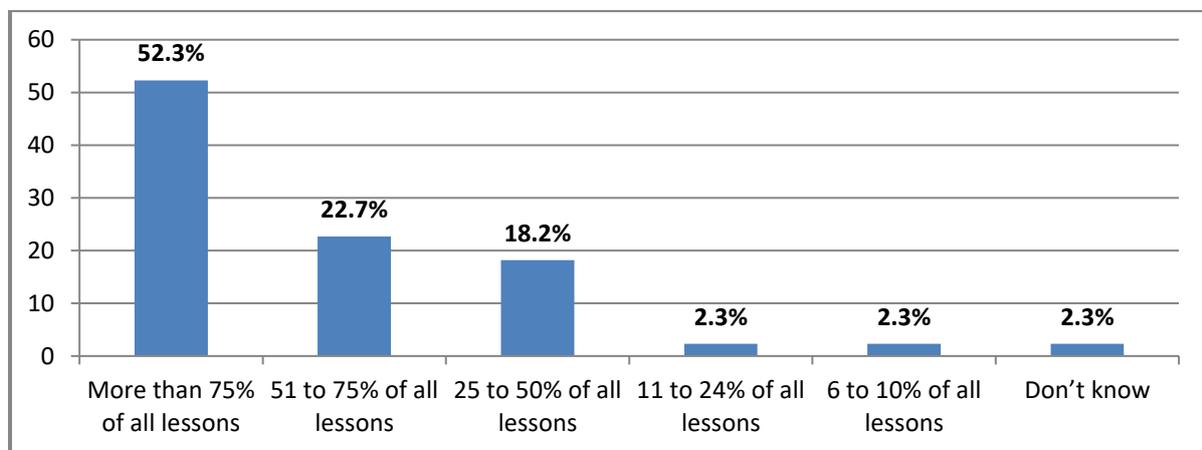


Figure 4-22: Using computer and/or Internet to prepare and to teach lessons in the last 12 months (n=44)

A Spearman's correlation was run to assess the relationship between experience with ICT for teaching in the last 12 months, and various variables. There were statistically significant relationships between the following variable: the participants always having been lecturers in the country ( $r_s[44] = -.301, p = .047$ ).

#### 4.5.2.8 Percentage of using ICT in all lessons by nurse educators

Of 44 nurse educators, 52.3% (n=23) reported using the internet in more than 75% of all lessons, 22.7% (n=10) reported between 71-50%, 18.2% (n=8), and 2.3% (n=1) reported respectively 11% to 24% of all lessons, and 6% to 10% of all lessons (Figure 4-23).



**Figure 4-23: Percentage of using ICT in all lessons by nurse educators (n=44)**

A Spearman's correlation was run to assess the relationship between percentages of time spent using ICT in all lessons by nurse educators, and various variables. There were statistically significant relationships between the following variables: Number of hours taught per week ( $r_s[44] = .355, p = .018$ ); ICT-based activities and materials for teaching ( $r_s[44] = -.426, p = .004$ ), and perceived skills in ICT ( $r_s[44] = -.448, p = .002$ ).

#### 4.5.2.9 Perceived teacher skills in ICT-related activities

The findings indicated the degree of confidence of the participants in using ICT in performing various activities listed as follows: (i) Produce a text using a word-processing programme; (ii) Use emails to communicate with others; (iii) Capture and edit digital photos, movies or other graphics; (iv) Edit text online containing Internet links and images; (v) Create a database; (vi) Edit a questionnaire online; (vii) Email a file to someone – another student or teacher; (viii) Organize computer files in folders and subfolders; (ix) Use a spreadsheet; (x) Use a spreadsheet

to plot a graph; (xi) Create a presentation with simple animation functions; (xii) Create a presentation with video or audio clips; (xiii) Participate in a discussion forum on the Internet; (xiv) Create and maintain blogs or websites; (xv) Participate in social networks; (xvi) Download and install software on a computer; (xvii) Download or upload curriculum resources from/to websites or learning platforms for students to use; (xviii) Teach students how to behave safely online; (xix) Teach students how to behave ethically online; (xx) Prepare materials to use with an interactive whiteboard.

The findings indicated that the majority had confidence in their skills in using ICT, with some variation in the levels of confidence. It was found that 97.7% (n=43) reported confidence in using email to send a file to someone (e.g. students or teachers); 95.5% (n=42) reported confidence in using email to communicate with others; 93.2% (n=41) reported confidence skills in producing a text using a word-processing programme; 88.6% (n=39) reported confidence in editing text online containing Internet links and images; 86.4% (n=38) reported confidence in capturing and editing digital photos, movies or other graphics; 86.4% (n=38) reported confidence in organising computer files in folders and subfolders; 86.4% (n=38) reported confidence in creating a presentation with video or audio clips; 86.4% (n=38) reported confidence in teaching students how to behave safely online; 84.1% (n=37) reported confidence in participating in a discussion forum on the Internet; 84.1% (n=37) reported confidence in teaching students how to behave ethically online; 81.8% (n=36) reported confidence skills in ICT to edit a questionnaire online; 79.5% (n=35) reported confidence skills in ICT to Create a presentation with simple animation functions; 79.5% (n=35) reported confidence in participating in social networks; 77.3% (n=34) reported confidence in downloading or uploading curriculum resources from/to websites or learning platforms for students to use; 70.5% (n=31) reported confidence in using a spreadsheet; 70.5% (n=31) reported confidence in downloading and installing software on a computer; 68.2% (n=30) reported confidence in preparing materials to use with an interactive whiteboard; 65.9% (n=29) reported confidence in using a spreadsheet to plot a graph; 54.5% (n=24) reported confidence in creating a database; 45.5% (n=20) reported confidence in creating and maintaining blogs or websites.

Although the majority of the participant reported some degree of confidence in using ICT, there were also those who reported that they did not have the ICT skills needed to perform a number of activities. It was found that 54.5% (n=24) reported not having the ICT skills needed to create and maintain blogs or websites; 45.5% (n=20) reported not having the ICT skills needed to

create a database; 34.1% (n=15) reported not having the ICT skills needed to use a spreadsheet to plot a graph; 31.8% (n=14) reported not having the ICT skills needed to prepare materials to use with an interactive whiteboard; 29.5% (n=13) reported not having the ICT skills needed to use a spreadsheet; 29.5% (n=13) reported not having the ICT skills needed to download and install software on a computer; 22.7% (n=10) reported not having the ICT skills needed to download or upload curriculum resources from/to websites or learning platforms for students to use; 20.5% (n=9) reported not having the ICT skills needed to create a presentation with simple animation functions; 20.5% (n=9) reported not having the ICT skills needed to participate in social networks; 18.2% (n=8) reported not having the ICT skills needed to edit a questionnaire online; 15.9% (n=7) reported not having the ICT skills needed to participate in a discussion forum on the Internet; 15.9% (n=7) reported not having the ICT skills needed to teach students how to behave ethically online; 13.6% (n=6) reported not having the ICT skills needed to capture and edit digital photos, movies or other graphics; 13.6% (n=6) reported not having the ICT skills needed to organize computer files in folders and subfolders; 13.6% (n=6) reported not having the ICT skills needed to create a presentation with video or audio clips; 13.6% (n=6) reported not having the ICT skills needed to teach students how to behave safely online; 11.4% (n=5) reported not having the ICT skills needed to edit text online containing Internet links and images; 6.8% (n=3) reported not having the ICT skills needed to produce a text using a word processing program; 4.5% (n=2) reported not having the ICT skills needed to use emails to communicate with others, and 2.3% (n=1) reported not having the ICT skills needed to email a file to someone, another student or teacher (Figure 4-24).

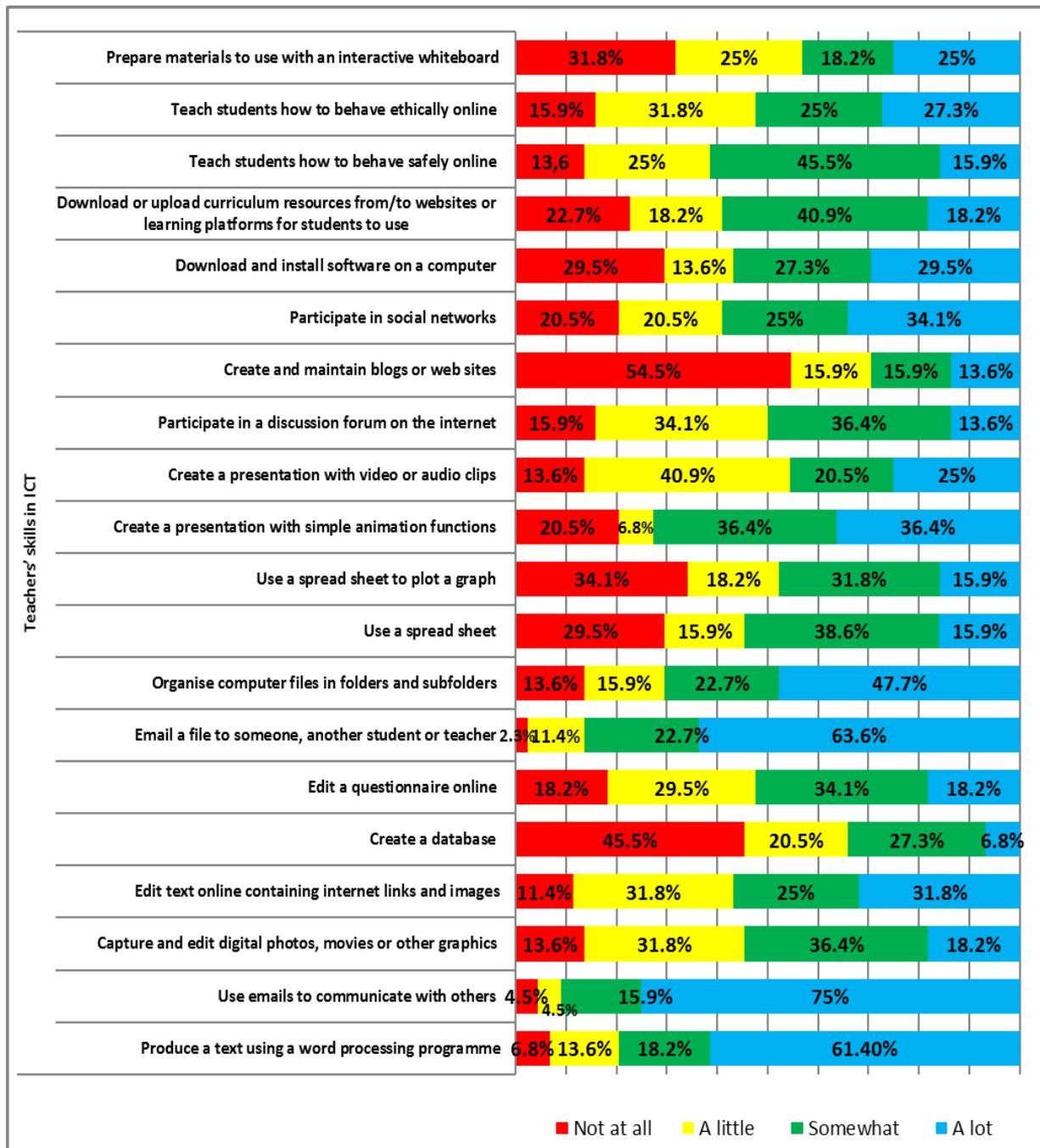


Figure 4-24: Teachers' skills in ICT related activities (n=44)

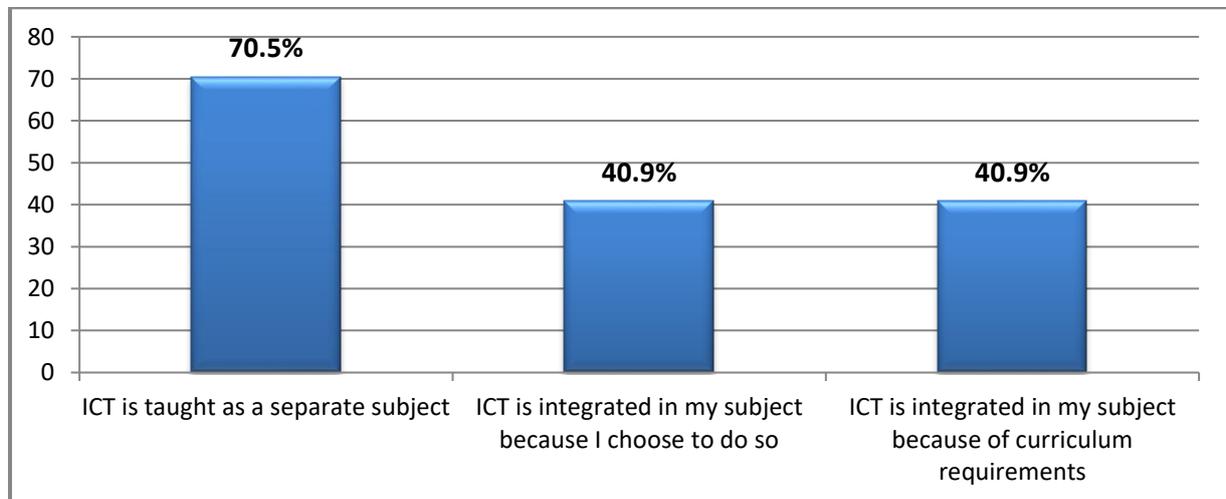
An overall score of the perceived ICT skills for teachers was calculated. Twenty items listed above were considered. The responses ranged from 1=not at all; 2= a little; 3= somewhat, and 4=a lot. The higher score indicated a high level of skills in using ICT in the listed activities, and the lower score indicated a low level of skills in performing these activities using ICT. The minimum score was 29 and the maximum score was 73. The mean score for teachers' skills in ICT was 53.32, the median was 53.5, and the standard deviation was 11.539. The 1st quartile

was 44, the 2nd quartile was 53, and the 3rd quartile was 61. These findings indicated that the majority of teachers perceived themselves as having ICT skills.

A Spearman's correlation was run to assess the relationship between the perceived skills in ICT and various variables. There was significant relationship between the following variables: teaching strategies used in the micro curriculum ( $r_s [44] = .387, p = .009$ ); percentage of time spent using ICT ( $r_s [44] = -.448, p = .002$ ); professional development in ICT in the past 2 years ( $r_s [44] = .341, p = .023$ ); source and the types of support ( $r_s [44] = .433, p = .003$ ); ICT based activities and materials used for teaching ( $r_s [44] = .545, p < .000$ ); materials used with the aid of computer/ internet ( $r_s [44] = -.361, p = .016$ ), and attitude towards ICT use in the school ( $r_s [44] = .423, p = .004$ ).

#### 4.5.2.10 How ICT is taught in the participant's target class

Of 44 participants, 70.5% (n=31) reported that ICT was taught as a separate subject, 40.9% (n=18) reported that they had incorporated ICT in their subjects because they chose to do so, 40.9% (n=18) reported that ICT was incorporated in their subjects because of curriculum requirements (Figure 4-25).



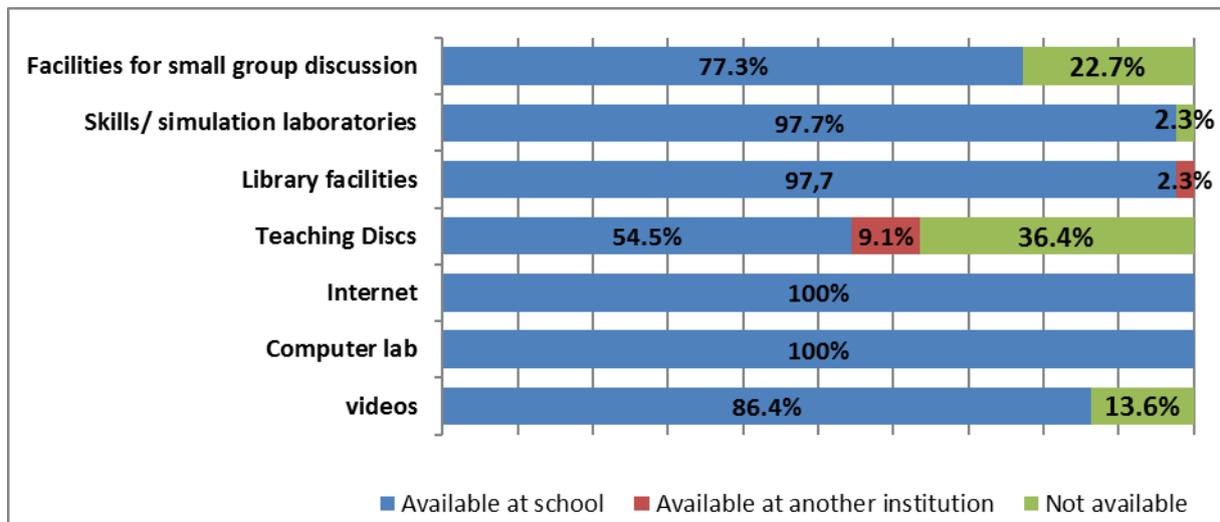
**Figure 4-25: How ICT is taught in the participant's target class**

A Spearman's correlation was run to assess the relationship between how ICT is taught in the target class and various variables. There were statistically significant relationships between the following variables: time spent in professional development opportunities ( $r_s [44] = -.307, p = .042$ ); learning activities in the target class with or without ICT ( $r_s [44] = -.305, p = .044$ ).

#### 4.5.2.11 Reported availability of materials to students

Nurse educators indicated that a number of materials were available to students. All participants, 100.0% (n=44), reported that computer labs were available to students; 100.0% (n=44) reported that the internet was available to students; 97.7% (n=43) reported that the library facilities are available to students; 97.7% (n=43) reported that skills/simulation laboratories were available to students; 86.4% (n=38) reported that videos were available to students, 77.3% (n=34) reported that facilities for small group discussion were available to students; and 54.5% (n=24) reported that teaching discs were available to students.

However, some of the participants reported that there were materials that were not available to students at the school: 36.4% (n=16) reported that teaching discs were not available, 22.7% (n=10) reported that facilities for small group discussion were not available, 13.6% (n=6) reported that videos were not available, and 2.3% (n=1) reported that skills/ simulation laboratories were not available. It was also noted that some of the facilities were available to students from other institutions: this included teaching discs, which was reported by 9.1% (n=), and library facilities, which was reported by 2.3% (n=1) (Figure 4-26).



**Figure 4-26: Reported availability of materials to students by nurse educators (n=44)**

A Spearman's correlation was run to assess the relationship between the availability of ICT-related materials to the students and various variables. There were statistically significant relationships with the following variable: Source and the type of support ( $r_s[44] = -.325, p = .032$ ).

### 4.5.3 Teaching strategies used by nurse educators in their micro curriculum

The findings showed that nurse educators used various teaching strategies including formal lectures, core lectures, group discussions, small group activities, self-directed learning, situation of integration (simulation), videos, role play, brainstorming, workbooks, projects, case studies, portfolios, and research. Of 44 nurse educators, 95.5% (n=42) reported using self-directed learning, 93.2% (n=41) reported using case studies, 88.6% (n=39) reported using group discussions, 81.8% (n=36) reported using small group activities, 72.7% (n=32) reported using formal lectures, 70.5% (n=31) reported using role play, 68.2% (n=30) reported using brain storming, 63.6% (n=28) reported using situation of integration, 63.6% (n=28) reported using videos. An average of 50.0% (n=22) reported using research; 43.2% (n=19) reported using work books. A small percentage, 27.3% (n=12) reported using projects, 25.0% (n=11) reported using core lectures, 11.4% (n=5) reported using portfolios. The findings further indicated that of 44 nurse educators, 88.6% (n=39) did not use portfolios, 75% (n=33) did not use core lectures, 72.7% (n=32) did not use projects, 56.8% (n=25) did not use work books, and 50% (n=22) did not use research as a teaching strategy (Figure 4-27).

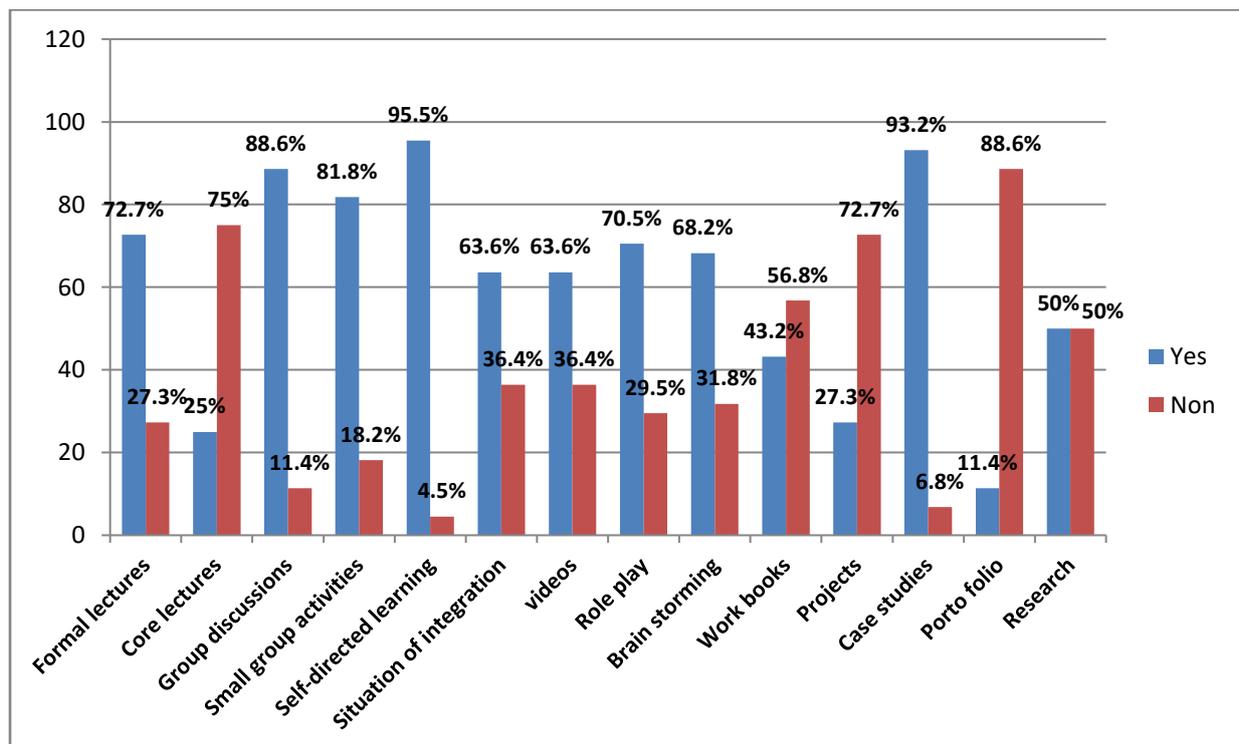


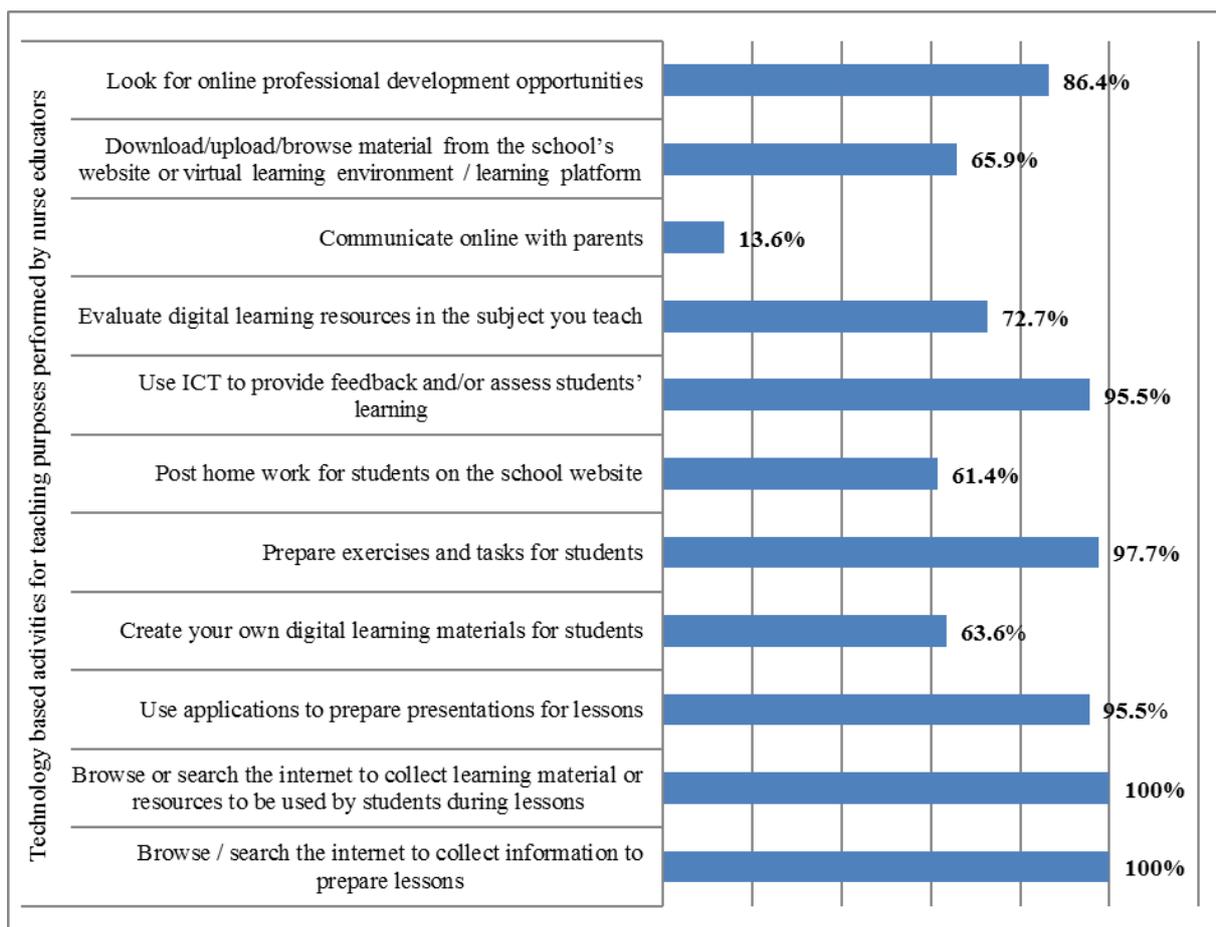
Figure 4-27: Teaching strategies used by nurse educators (n=44)

A Spearman's correlation was run to assess the relationship between teaching strategies used in the micro curriculum, and various variables. There were statistically significant relationships

between the following variables: years of working experience ( $r_s[44]= .382, p= .011$ ); condition of accessibility to infrastructure in the target class ( $r_s[44]= .308, p= .042$ ); source and the type of support ( $r_s[44]= .410, p= .006$ ); ICT based activities used for teaching and material ( $r_s[44]= .413, p= .005$ ), and perceived skills in ICT ( $r_s[44]= .387, p= .009$ ).

#### **4.5.4 Technology-based activities for teaching purposes performed by nurse educators**

The findings indicated that participants used ICT in a number of teaching activities with variation in the frequency. Overall, 100% (n=44) reported using ICT to browse/ search the Internet to collect information to prepare lessons; 100% (n=44) reported using ICT to browse or search the Internet to collect learning material or resources to be used by students during lessons; 97.7% (n=43) reported using ICT to prepare exercises and tasks for students; 95.5% (n=42) reported using ICT applications to prepare presentations for lessons; 95.5% (n=42) reported using ICT to provide feedback and/or assess students' learning; 86.4% (n=38) reported using ICT to look for online professional development opportunities; 72.7% (n=32) reported using ICT to evaluate digital learning resources in the subject they teach; 65.9% (n=29) reported using ICT to download/upload/browse material from the school's website or virtual learning environment/ learning platform; 63.6% (n=28) reported using ICT to create their own digital learning materials for students; 61.4% (n=27) reported using ICT to post homework for students on the school website (Figure 4-28).



**Figure 4-28: Technology-based activities for teaching purposes performed by nurse educators (n=44)**

#### **4.5.5 Frequency of using for teaching purposes**

In assessing the level of ICT use for teaching purposes, technology-based activities were analysed by frequency using a 5-point Likert scale, from never to every day; wide variation was found in the frequency of ICT use for teaching purposes.

By frequency, the activities considered in calculating an overall score were the following: (i) Browse/search the Internet to collect information to prepare lessons. (ii) Browse/search the Internet to collect learning material or resources to be used by students during lessons. (iii) Use applications to prepare presentations for lessons. (iv) Create one's own digital learning materials for students. (v) Prepare exercises and tasks for students. (vi) Post homework for students on the school website. (vii) Use ICT to provide feedback and/or assess students' learning. (viii) Evaluate digital learning resources in the subject one teaches. (ix) Communicate online with parents. (x) Download/upload/browse material from the school's website or virtual

learning environment/learning platform. (xi) Look for online professional development opportunities (Table 4-13).

**Table 4-13: Frequency of using technology-based activities for teaching purposes (n=44)**

	Never used		Rarely used		Several times a month		At least once a week		Every day or almost every day	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Browse/ search the Internet to collect information to prepare lessons	0	0	3	6.8	12	27.3	10	22.7	19	43.2
Browse or search the Internet to collect learning material or resources to be used by students during lessons	0	0	7	15.9	17	38.6	9	20.5	11	25.0
Use applications to prepare presentations for lessons	2	4.5	9	20.5	20	45.5	6	13.6	7	15.9
Create your own digital learning materials for students	16	36.4	7	15.9	12	27.3	6	13.6	3	6.8
Prepare exercises and tasks for students	1	2.3	6	13.6	15	34.1	6	13.6	16	36.4
Post home work for students on the school website	17	38.6	5	11.4	16	36.4	3	6.8	3	6.8
Use ICT to provide feedback and/or assess students' learning	2	4.5	17	38.6	15	34.1	4	9.1	6	13.6
Evaluate digital learning resources in the subject you teach	12	27.3	13	29.5	10	22.7	7	15.9	2	4.5
Communicate online with parents	38	86.4	2	4.5	2	4.5	1	2.3	1	2.3
Download/upload/browse material from the school's website or virtual learning environment/learning platform	15	34.1	5	11.4	16	36.4	3	6.8	5	11.4
Look for online professional development opportunities	6	13.6	10	22.7	15	34.1	5	11.4	8	18.2

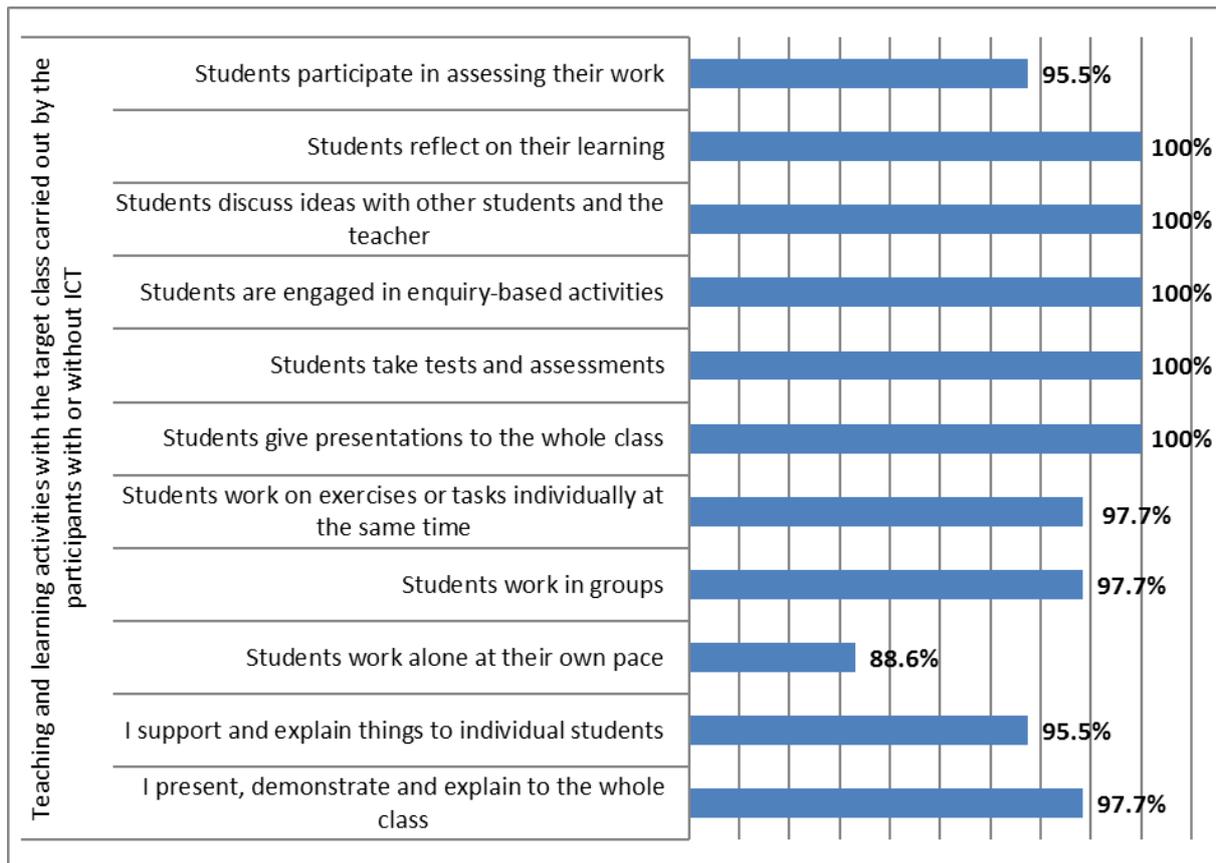
The overall ICT-based teaching activities score mentioned above was computed and scored. Eleven items were considered and the responses ranged from 1=never used, 2=rarely used, 3=several times a month, 4=At least once a week, to 5= every day/almost every day. A higher score indicated a higher frequency of ICT-based teaching activities, and a lower score indicated lower frequency used in ICT-based teaching activities. The minimum score was 19 and the maximum score was 55. The mean score of ICT-based teaching activities was 31.18, and the standard deviation was 7.72; 1st quartile was 25, 2nd quartile was 31 and 3rd quartile was 37. These findings indicate that nurse educators overall used ICT for teaching purposes.

A Spearman's correlation was run to assess the relationship between frequency of technology-based activities for teaching purposes and other variables. There were statistically significant relationships between the following variables: teaching strategies used in the micro curriculum ( $r_s[44] = .413, p = .005$ ); percentage of time spent using ICT ( $r_s [44] = -.426, p = .004$ ); professional development in ICT in the past 2 Years ( $r_s [44] = .538, p < .000$ ); perceived nurse educators' skills in ICT ( $r_s [44] = .545, p < .000$ ).

#### **4.5.6 Teaching and learning activities with the target class done with or without ICT**

The findings indicate that various teaching and learning activities were carried out in the target class with or without ICT. These activities were the following: (i) Teachers present, demonstrate and explain to the whole class. (ii) Teachers support and explain things to individual students. (iii) Students work alone at their own pace. (iv) Students work in groups. (v) Students work on exercises or tasks individually at the same time. (vi) Students give presentations to the whole class. (vii) Students take tests and assessments. (viii) Students are engaged in enquiry-based activities. (ix) Students discuss ideas with other students and the teacher. (x) Students reflect on their learning. (xi) Students participate in assessing their work.

Findings from computing the data into two categories on a Likert scale (those who performed activities in teaching and learning with or without ICT, and those who did not) were quite significant, although there was some variation from none to a lot, as shown in Table 4-14. It was found performed frequently the above-mentioned activities. Of 44 participants, 100% (n=44) reported that students gave presentations to the whole class; 100% (n=44) reported that students took tests and assessments; 100% (n=44) reported that students were engaged in enquiry-based activities; 100% (n=44) reported that students discussed ideas with other students and the teacher; 100.0% (n=44) reported that students reflected on their learning; 97.7% (n=43) reported that they presented, demonstrated and explained to the whole class; 97.7% (n=43) reported that students worked in groups; 97.7% (n=43) reported that students worked on exercises or tasks individually at the same time; 95.5% (n=42) reported that they supported and explained things to individual students; 95.5% (n=42) reported that students participated in assessing their work; 88.6% (n=39) reported that students worked alone at their own pace (Figure 4-29).



**Figure 4-29: Teaching and learning activities with the target class carried out by the participants with or without ICT (n=44)**

#### **4.5.7 Frequency of activities conducted by participants with the target class with or without ICT**

The table below shows the frequency of teaching and learning activities with the target class carried out by the participants with or without ICT. Of 44 participants, 86.4% (n=38) reported that they presented, demonstrated and explained to the whole class a lot, and 6.8% (n=6) did so sometimes, 45% (n=20) reported that they sometimes supported and explained things to individual students, and 31.8% (n=14) reported doing so a lot. Regarding letting the student work alone, 38.6% (n=17) reported doing so sometimes and 29.5% (n=13) reported doing so a lot; 56.8% (n=25) reported that sometimes students work in groups, and 36.4% (n=16) reported that students work in groups a lot. On having student work on exercises or tasks individually at the same time: 63.6% (n=28) reported doing so sometimes, and 27.3% (n=12) reported doing so a lot. On having students giving presentations to the whole class, 70.5% (n=31) of the participants reported doing so a lot whereas 25% (n=11) reported doing so sometimes. Of 44 nurse educators, 77.3% (n=34) reported that students take tests and assessments a lot, and 22.7% (n=10) reported that students did so sometimes. On students being engaged in inquiry activities,

59.1% (n=26) reported that students did so sometimes and 29.5% (n=13) reported that student did so a lot. Of 44 participants, 59.1% (n=26) reported that students discuss ideas with other students and the teacher a lot, whereas 36.4% (n=16) reported that they do it sometimes. It was also found that students reflected on their learning, 43.2% (n=19) of nurse educators reported that students did so sometimes and 38.6% (n=17) reported that students did so a lot. Of 44 participants, 40.9% (n=18) reported that students participated in assessing their work sometimes, whereas 38.6% (n=17) reported that students did so a lot (Table 4-14).

**Table 4-14: Frequency of activities conducted by participants with the target class with or without ICT (n=44)**

	None		A little		Sometimes		A lot	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
I present, demonstrate and explain to the whole class	1	2.3	2	4.5	3	6.8	38	86.4
I support and explain things to individual students	2	4.5	8	18.2	20	45.5	14	31.8
Students work alone at their own pace	5	11.4	9	20.5	17	38.6	13	29.5
Students work in groups	1	2.3	2	4.5	25	56.8	16	36.4
Students work on exercises or tasks individually at the same time	1	2.3	3	6.8	28	63.6	12	27.3
Students give presentations to the whole class	0	0	2	4.5	11	25.0	31	70.5
Students take tests and assessments	0	0	0	0	10	22.7	34	77.3
Students are engaged in enquiry-based activities	0	0	5	11.4	26	59.1	13	29.5
Students discuss ideas with other students and the teacher	0	0	2	4.5	16	36.4	26	59.1
Students reflect on their learning	0	0	8	18.2	19	43.2	17	38.6
Students participate in assessing their work	2	4.5	7	15.9	18	40.9	17	38.6

An overall score of teaching and learning activities with the target class conducted by the participants with or without ICT was calculated. Eleven items as listed above were considered and the responses was a Likert scale ranging from 1=None; 2=A little; 3=Sometimes, to 4=A lot. The higher the score, the more frequently participants used the teaching and learning activities with or without ICT, and a lower score indicated a lower frequency of using various teaching activities with or without ICT. The minimum score was 27 and the maximum score was 44. The mean score of teaching and learning activities carried out with or without ICT was 36.61, and the standard deviation was 3.499. The 1st quartile was 34, 2nd quartile was 37, and the 3rd quartile was 39. These findings indicate that the majority of nurse educators used student-centred approaches in teaching with or without ICT.

A Spearman's correlation was run to assess the relationship between the frequencies of types of teaching and learning activities conducted in the target classes with or without ICT and other variables. There were statistically significant relationships between the following variables:

qualification in nursing education ( $r_s [44] = -.303, p = .046$ ); how ICT is taught to the target class ( $r_s [44] = .305, p = .044$ ).

#### 4.5.8 Materials used by participants with the aid of computer/Internet in their target classes

The findings indicate that a number of materials were used with the aid of computer/Internet. Of 44 participants, 86.4% (n=38) reported using material that they have searched the internet; 63.6% (n=28) reported using existing online material from established educational sources; 45.5% (n=20) reported using material that is available in the school's computer network or database; 40.9% (n=18) reported using electronic offline material (e.g. CD-ROM).

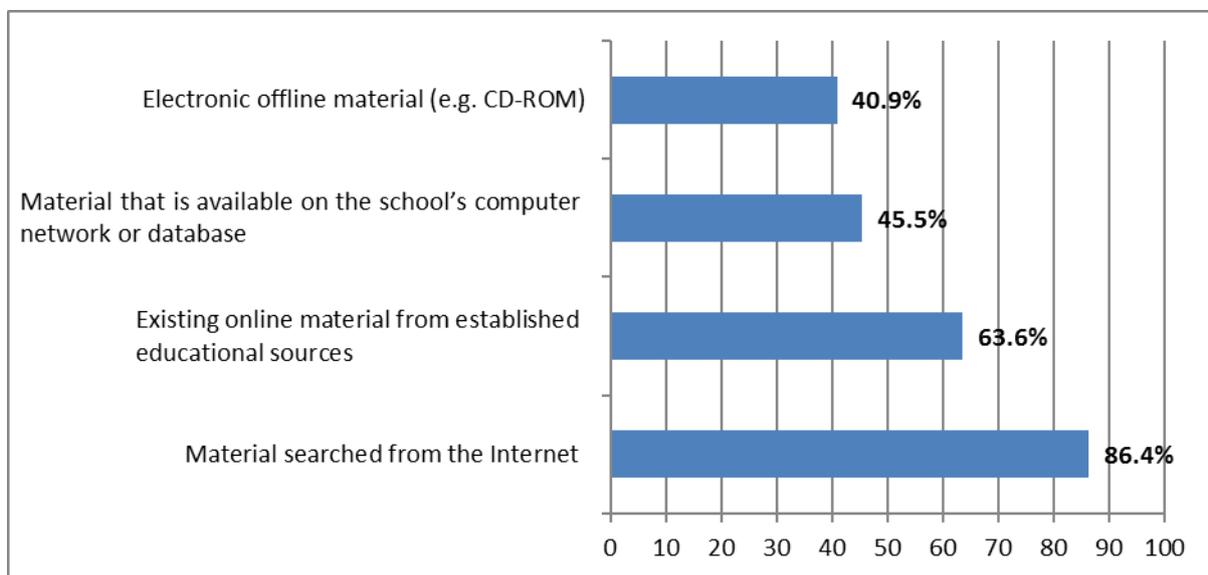


Figure 4-30: Materials used by participants with the aid of computer/Internet (n=44)

To calculate the overall score of materials used with the aid of computer/Internet by the participants, four items listed above were considered. The minimum score was 4 and the maximum score was eight. The higher the score, the more the respondents used materials used with the aid of computer/Internet. The mean of participants' responses score was 5.654, the mode 6, and the median 6. and the standard deviation 1.013. The 1st quartile was 5, 2nd quartile was 6, and 3rd quartile was 6. These findings indicated that the majority of participants used materials used with the aid of computer/Internet for teaching purposes.

A Spearman's correlation was run to assess the relationship between the materials used with the aid of computer/Internet, and various variables. There were statistically significant

relationships between the following variables: Professional development in ICT in the past two years ( $r_s[44] = -.305, p = .044$ ), and perceived skills in ICT ( $r_s[44] = -.361, p = .016$ ).

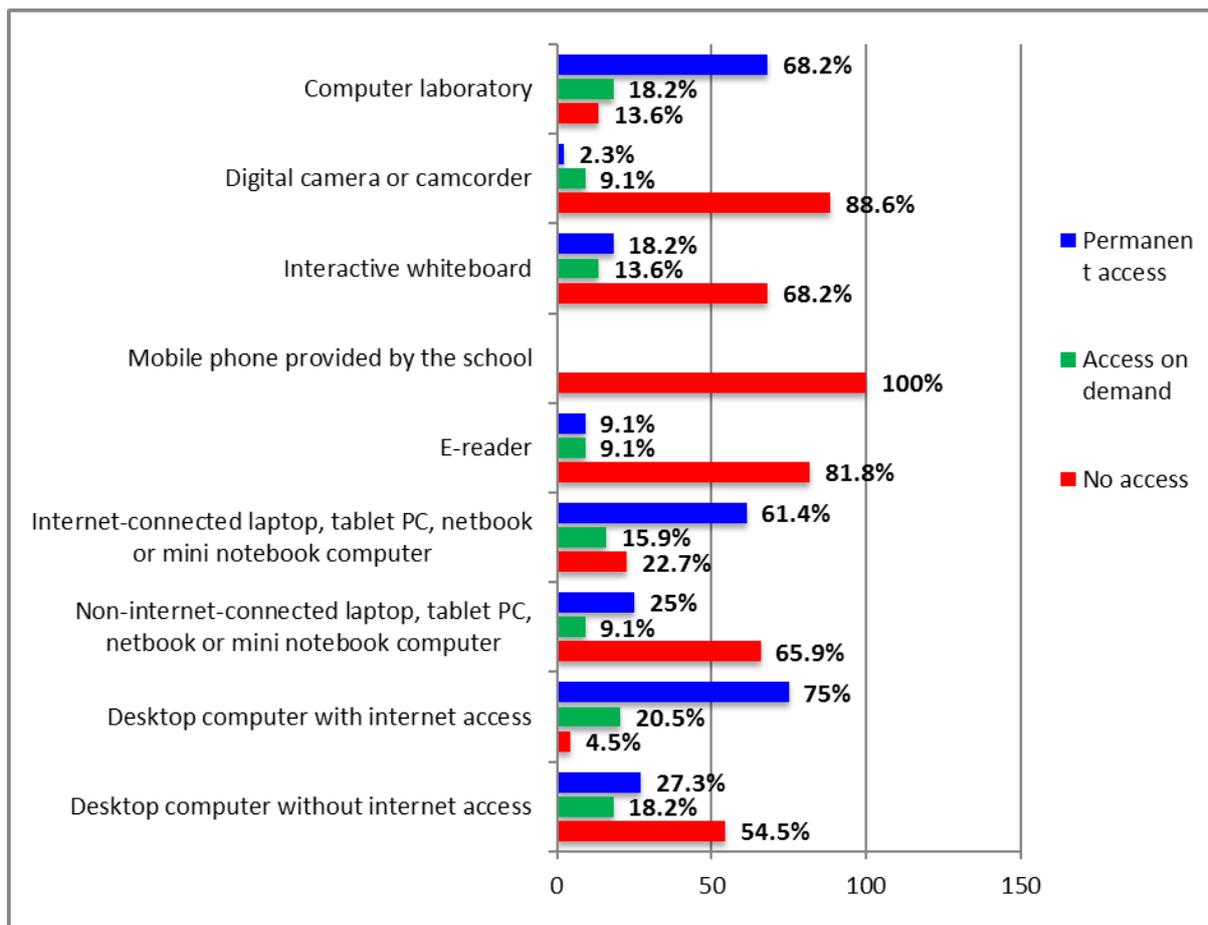
#### **4.5.9 Availability of equipment for participants to use in lessons with the target class**

Participants reported that equipment was permanently available, available on demand, or not available at all.

**Permanently available equipment:** 75.0% (n=33) reported permanent availability of desktop computer with Internet access; 68.2% (n=30) reported permanent availability computer laboratory; 61.4% (n=27) reported permanent availability of internet-connected laptop, tablet PC, netbook or mini notebook computer; 27.3% (n=12) reported permanent availability of desktop computer without Internet access; 25.0% (n=11) reported permanent availability of non-Internet-connected laptop, tablet PC, netbook or mini notebook computer.

**Available on demand:** a small percentage, 20.5% (n=9) reported availability on demand of desktop computer with Internet access; 18.2% (n=8) reported availability on demand of desktop computer without Internet access; 18.2% (n=8) reported availability on demand of computer laboratory; 15.9% (n=7) reported on demand of internet-connected laptop, tablet PC, netbook or mini-notebook computer; and 9.1% (n=4) reported availability on demand of digital camera or camcorder.

**Not available:** Unavailability of some materials was also reported by the participants. Of 44 participant, 100.0% (n=44) reported no access to mobile phone provided by the school; 88.6% (n=39) reported unavailability of digital camera or camcorder; 81.8% (n=36) reported E-reader; 68.2% (n=30) reported unavailability of interactive whiteboard; 65.9% (n=29) reported unavailability of non-Internet-connected laptop, tablet pc, netbook or mini notebook computer; 54.5% (n=24) reported unavailability of desktop computer without Internet access; 22.7% (n=10) reported Internet-connected laptop, tablet pc, netbook or mini notebook computer; 13.6% (n=6) reported having no access to computer laboratory and a small percentage reported 4.5% (n=2) reported having no access to desktop computer with Internet access (Figure 4-31).



**Figure 4-31: Availability of equipment for lessons with the target class (n=44)**

A Spearman's correlation was run to assess the relationship between access to infrastructure in the target classes and various variables. There were statistically significant relationships between the following variables: age ( $r_s[44] = .314, p = .038$ ); teaching strategies used in the micro curriculum ( $r_s[44] = .308, p = .042$ ), and school shared vision about ICT use ( $r_s[44] = .310, p = .041$ ).

#### **4.5.10 Provision to teachers and students of laptops for their own use**

Of 44 participants, 95.5% (n=42) reported that teachers were not provided with laptops for their own use, while a small percentage, 4.5% (n=2), reported that teachers were provided with laptops by the school. It was further reported by the majority of nurse educators, 95.5% (n=42), that students were not provided with laptops for their own use, while a small percentage, 4.5% (n=2), reported that teachers were provided with laptops by the school (Figure 4-32).

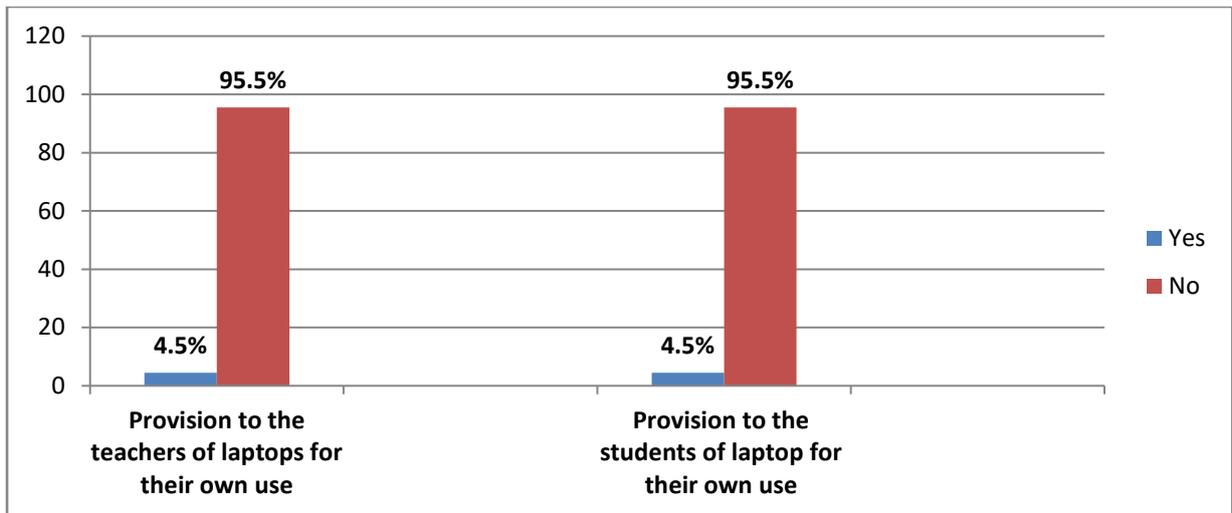


Figure 4-32: Provision of laptops to teachers and students for their own use (n=44)

#### 4.5.11 Permission for target class students to use personally owned devices at school for learning

The findings showed that students were allowed to use personal devices for learning. Of 44 participants, 93.2% (n=41), reported that students were allowed to use laptops, tablets, netbook, notebooks, and 77.3% (n=34) reported that students were allowed to use mobile phones or smartphones in their target classes for learning purposes. However, a significant percentage, 22.7% (n=10), reported that in their target classes students were not allowed to use mobile or smart phones (Figure 4-33).

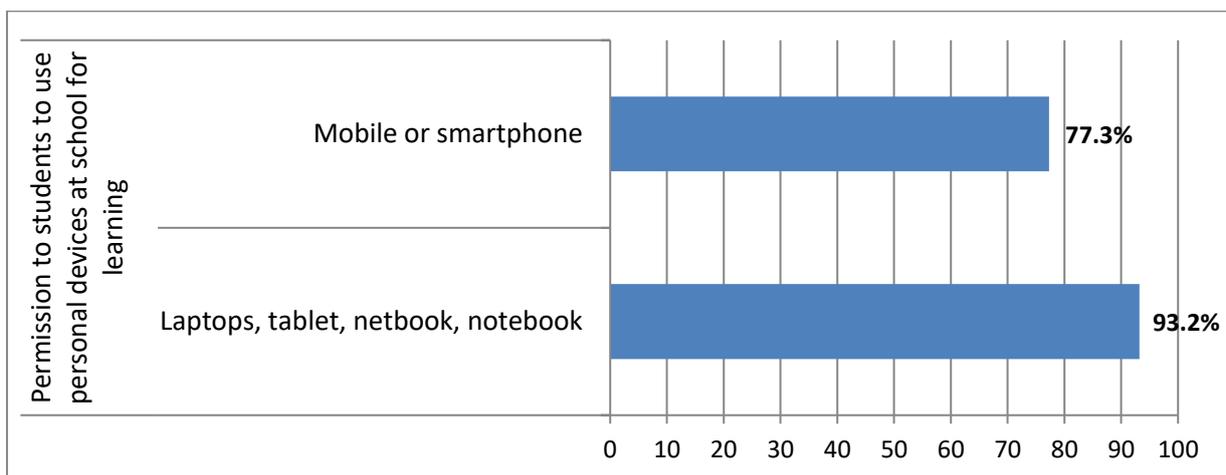


Figure 4-33: Permission for students to use their personally owned devices at school for learning (n=44)

## 4.5.12 Support given to teachers in ICT

### 4.5.12.1 Compulsory ICT training

Of 44 participants, 63.6% (n=28) reported that it was compulsory to participate in ICT training, whereas 36.4% (n=16) reported that it was not compulsory (Figure 4-34).

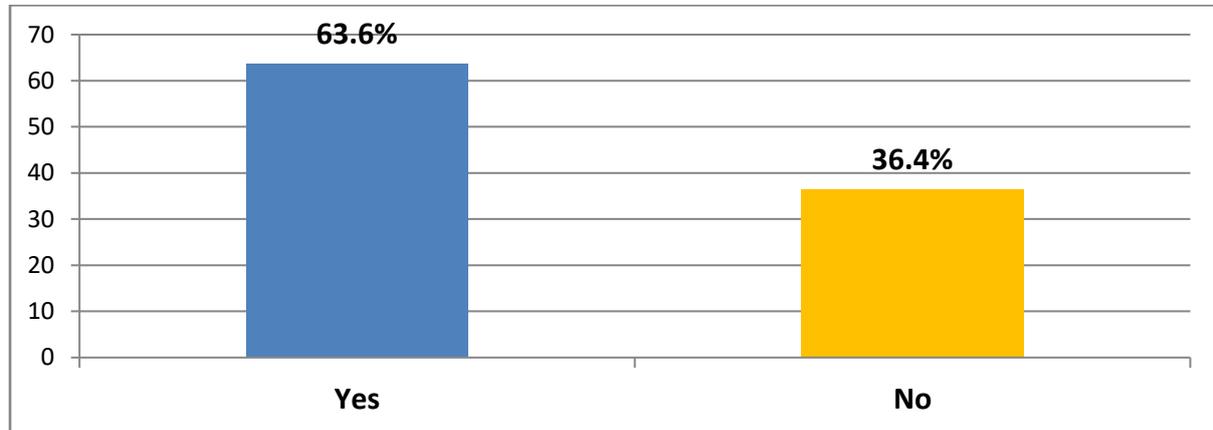


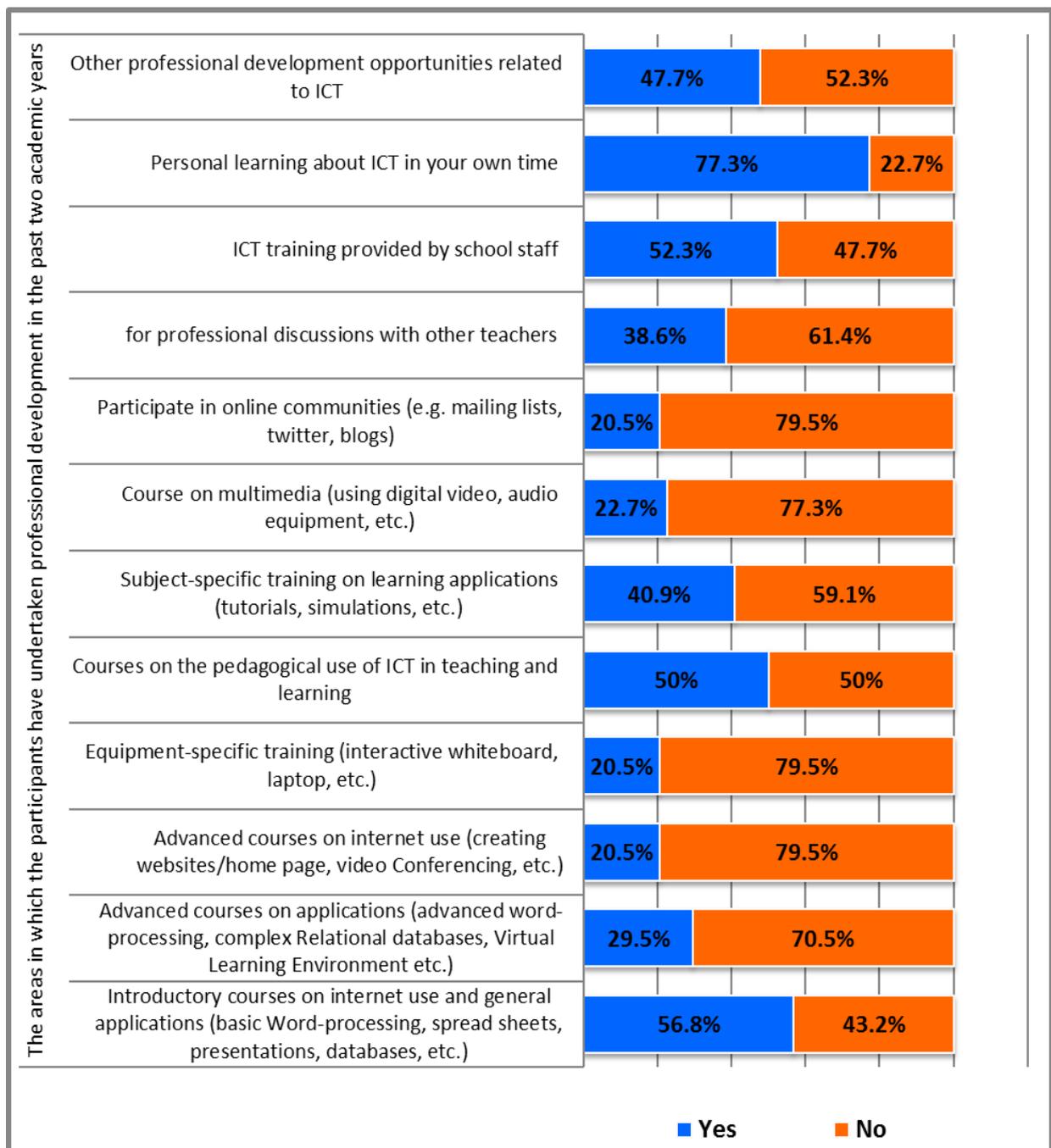
Figure 4-34: Compulsory ICT training for the nurse educators (n=44)

### 4.5.12.2 Areas in which participants undertook professional development in the past two academic years

In the findings regarding areas in which participant had undertaken professional development in the previous two academic years, of 44 participants, 77.3% (n=34) reported personal learning about ICT in their own time; 56.8% (n=25) reported introductory courses on Internet use and general applications (basic Word processing, spreadsheets, presentations, databases, etc.); 52.3% (n=23) reported ICT training provided by school staff; 50.0% (n=22) reported courses on the pedagogical use of ICT in teaching and learning 47.7% (n=21) reported other professional development opportunities related to ICT; 40.9% (n=18) reported subject-specific training on learning applications (tutorials, simulations, etc.); 38.6% (n=17) reported professional discussions with other teachers; 29.5% (n=13) reported advanced courses on applications (advanced word-processing, complex relational databases, virtual learning environment, etc.); 22.7% (n=10) reported course on multimedia (using digital video, audio equipment, etc.); 20.5% (n=9) reported advanced courses on Internet use (creating websites/home page, video conferencing, etc.); 20.5% (n=9) reported equipment-specific training (interactive whiteboard, laptop, etc.); 20.5% (n=9) reported participation in online communities (e.g. mailing lists, twitter, blogs) (Figure 4-35).

Although the findings showed significant percentages of participants who had undertaken professional development, they also indicated that a significant number of participants had not undertaken this professional development, which is crucial for use of the e-learning platform. Of 44 participants, 79.5% (n=35) had not done an advanced course on Internet use (creating websites/home page, video conferencing, etc.); 79.5% (n=35) had not had equipment-specific training (interactive whiteboard, laptop, etc.); 79.5% (n=35) did not participate in online communities (e.g. mailing lists, twitter, blogs); 77.3% (n=34) had not done a course on multimedia (using digital video, audio equipment, etc.); 70.5% (n=31) had not done an advanced course on applications (advanced word-processing, complex relational databases, virtual learning environment etc.); 61.4% (n=27) did not have professional discussions with other teachers; 59.1% (n=26) had not had subject-specific training on learning applications (tutorials, simulations, etc.), 52.3% (n=23) had not had any other professional development opportunities related to ICT; 50.0% (n=22) had not done courses on the pedagogical use of ICT in teaching and learning; 47.7% (n=21) had not had ICT training provided by school staff; 43.2% (n=19) had not done an introductory course on Internet use and general applications: basic word-processing, spreadsheets, presentations, databases, etc. (Figure 4-35).

A Spearman's correlation was run to assess the relationship between professional development in ICT in the last 12 months, and various variables. There were statistically significant relationships between the following variables: qualification in nursing education ( $r_s[44] = -.309$ ,  $p = .041$ ); time spent in the professional development opportunities ( $r_s[44] = .572$ ,  $p < .000$ ); ICT-based activities and materials used for teaching ( $r_s[44] = .538$ ,  $p < .000$ ); materials used with the aid of computers/ internet ( $r_s[44] = -.305$ ,  $p = .044$ ); perceived skills in ICT ( $r_s[44] = .341$ ,  $p = .023$ ).



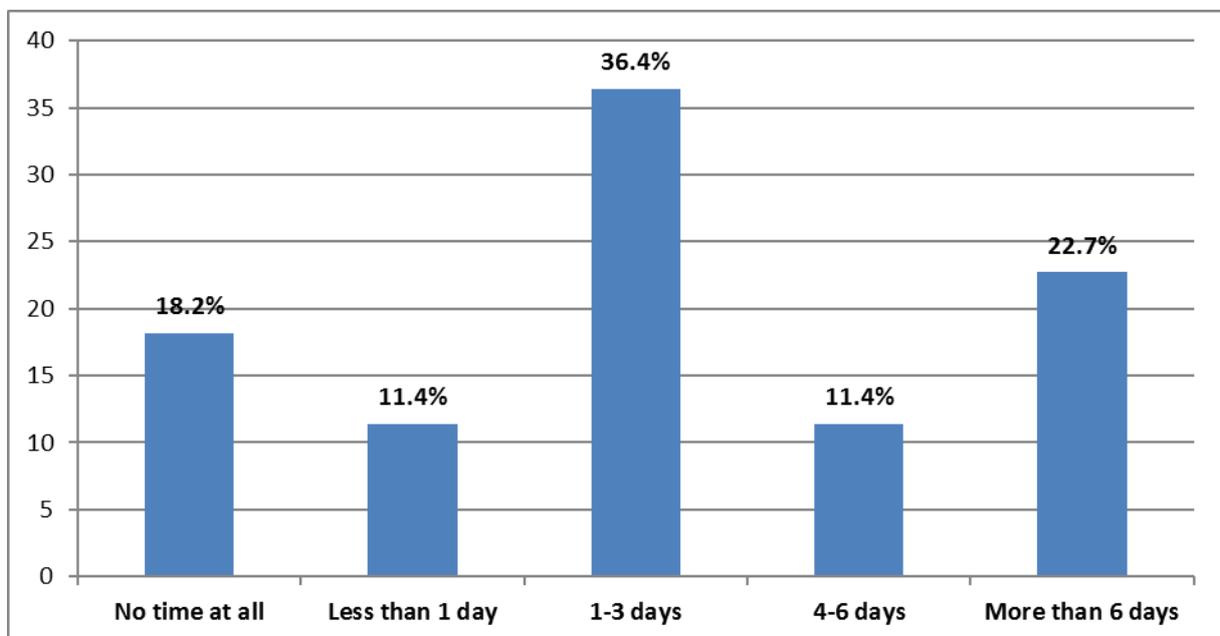
**Figure 4-35: Areas in which participants had professional development in the previous two academic years (n=44)**

#### 4.5.12.3 Duration of participants’ involvement during the past two academic years in professional development opportunities

To reiterate, the professional development opportunities reported in this study were as follows: introductory courses on Internet use and general applications (basic word-processing, spreadsheets, presentations, databases, etc.); advanced courses on applications (advanced word-processing; complex relational databases; virtual learning environment, etc.); advanced

courses on Internet use (creating websites/home page, video conferencing, etc.); equipment-specific training (interactive whiteboard, laptop; etc.); courses on the pedagogical use of ICT in teaching and learning; subject-specific training on learning applications (tutorials; simulations; etc.); course on multimedia (using digital video, audio equipment, etc.); participation in online communities (e.g. mailing lists; Twitter; blogs); professional discussions with other teachers; ICT training provided by school staff; personal learning in ICT in their own time; other professional development opportunities related to ICT.

Regarding duration of involvement in the opportunities mentioned, of 44 participants, 36.4% (n=16) reported 1–3 days, 22.7% (n=10) reported more than 6 days; 18.2% (n=8) reported no involvement at all in the activities mentioned above; 11.4% (n=5) reported less than 1 day, and 11.4% (n=5) reported 4–6 days (Figure 4-36).



**Figure 4-36: Duration of participants' involvement in professional development opportunities (n=44)**

A Spearman's correlation was run to assess the relationship between the time spent on professional development opportunities and various variables. There were statistically significant relationships between the following variables: how ICT was taught in the target class ( $r_s[44] = -.341, p = .042$ ); professional development in the past two years ( $r_s[44] = .572, p < .000$ ).

#### 4.5.12.4 Source and the type of support for nurse educators

The findings showed that participants received support from various sources, including the following: a more experienced/ knowledgeable teacher; school ICT coordinator; other school staff; experts from outside the school; an online helpdesk, community or website. It was found that the support was mostly technical support, mostly pedagogical, or both technical and pedagogical. It was also found that there were participants who used some of the support or rarely used any support.

The findings were that 43.2% (n=19) received mostly technical support from school ICT coordinator, 36.4 (n=16) received both technical and pedagogical support from more experienced/ knowledgeable teachers, 31.8% (n=14) received mostly technical support from more experienced or knowledgeable teachers. In addition, 25% (n=11) received technical and pedagogical support from experts from outside the school, and 25% (n=11) reported that both technical and pedagogical support were also provided by other school staff (Figure 4-37).

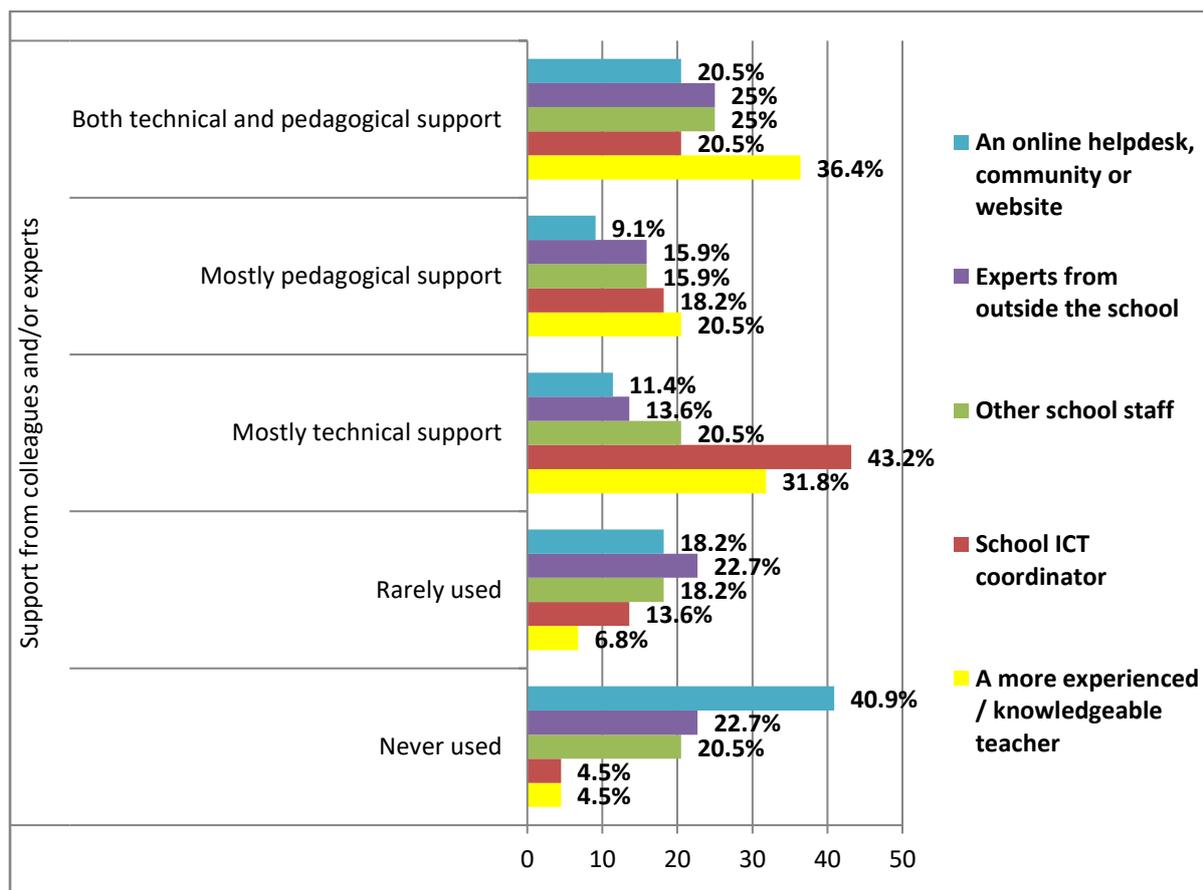


Figure 4-37: Source and type of support for nurse educators (n=44)

A Spearman's correlation was run to assess the relationship between source and type of support for nurse educators and other variables. There were statistically significant relationships between the following variables: extent of availability of ICT related equipment to the students ( $r_s[44] = -.323, p = .032$ ), Teaching strategies are used in the micro curriculum ( $r_s[44] = .410, p = .006$ ); and perceived skills in ICT ( $r_s[44] = .433, p = .003$ ).

#### **4.5.13 Participants' opinions on positive impact on student learning of ICT use**

The findings indicated that the majority of the participants had a positive opinion regarding the impact of ICT use on students' learning. Of 44 nurse educators, 56.8% (n=25) reported that students understand somewhat more easily what they learn; 52.3% (n=23) reported that students feel a lot more autonomous in their learning (they can repeat exercises if needed, explore in more detail topics that they are interested in, etc.), and 31.8% (n=14) reported a somewhat positive impact on student learning of ICT use; 47.7% (n=21) reported that ICT improves the class climate a lot (students more engaged, less disturbing), and 27.3% (n=12) reported that there is a somewhat positive impact on student learning of ICT use; 47.7% (n=21) reported that students concentrate a lot more on their learning, and 36.4% (n=16) reported somewhat; 45.5% (n=20) reported that students try a lot harder in what they are learning, and 40.9% (n=18) reported that they try somewhat harder, and 29.5% (n=13) reported that ICT use has a lot of positive impact on student learning; 43.2% (n=19) reported that ICT facilitates collaborative work between students a lot, and 36.4% (n=16) reported that there is a somewhat positive impact on student learning of ICT use.; 40.9% (n=18) reported that students remember a lot more easily what they've learnt, 36.4% (n=16) reported that there is a somewhat positive impact on student learning of ICT use.

Although the above-mentioned percentages for "a lot" and "somewhat" indicated that participants had mostly positive opinions on the impact of ICT use on student learning, a small percentage of participants reported that there was a little positive impact, and these percentages should not be ignored. Of 44 participants, 20.5% (n=9) reported that there was little positive impact, and 2.3% (n=1) reported that there was no positive impact in relation to students remembering more easily what they've learnt; 18.2% (n=8) reported little positive impact, and 6.8% (n=3) reported no impact at all in ICT improving the class climate (students more engaged, less disturbing); 15.9% (n=7) reported little positive impact, and 4.5% (n=2) reported no impact all in ICT facilitating collaborative work between students; 13.6% (n=6) reported

little positive impact, and 2.3% (n=1) reported no impact at all on students feeling more autonomous in their learning (they can repeat exercises if needed, explore in more detail topics that they are interested in, etc.); 13.6% (n=6) reported little positive impact, and 2.3% (n=1) reported no impact at all on students concentrating more on their learning; 11.4% (n=5) reported little positive impact, and 2.3% (n=1) reported no impact at all on students trying harder in what they are learning; 11.4% (n=5) reported little positive impact, and 2.3% (n=1) reported no impact at all on students understanding more easily what they learn (Table 4-15).

**Table 4-15: Participant opinions on positive impact of ICT on student learning**

	Not at all		A little		Somewhat		A lot	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Students concentrate more on their learning	1	2.3	6	13.6	16	36.4	21	47.7
Students try harder in what they are learning	1	2.3	5	11.4	18	40.9	20	45.5
Students feel more autonomous in their learning (they can repeat exercises if needed, explore in more detail topics that they are interested in, etc.)	1	2.3	6	13.6	14	31.8	23	52.3
Students understand more easily what they learn	1	2.3	5	11.4	25	56.8	13	29.5
Students remember more easily what they've learnt	1	2.3	9	20.5	16	36.4	18	40.9
ICT facilitates collaborative work between students	2	4.5	7	15.9	16	36.4	19	43.2
ICT improves the class climate (students more engaged, less disturbing)	3	6.8	8	18.2	12	27.3	21	47.7

An overall score of the positive impact of ICT on student learning was calculated. Seven items listed above were considered and the responses were on a Likert scale ranging from 1=No at all; 2=A little; 3=somewhat, to 4=A lot. A higher score indicated a positive opinion on the impact on student learning of using ICT, and a lower score indicated negative opinion about the impact on student learning of using ICT. The minimum score was 13 and the maximum score was 28. The mean score was 22.57, the standard deviation was 4.4 and the median was 23 on positive impact on student learning of using ICT. The 1st quartile was 19, 25, 2nd quartile was 23, and the 3rd quartile was 26. These findings indicated that the majority of the participants had a positive opinion about the impact on student learning of using ICT.

A Spearman's correlation was run to assess the relationship between the positive impact of using ICT on student learning and various variables. There was significant relationship between the following variables: gender ( $r_s[44]= .303, p= .045$ ); number of subject taught by participants ( $r_s [44]= -.478, p= .001$ ), and attitude towards the ICT use at school ( $r_s [44]= .474, p= .001$ ).

#### **4.5.14 Attitudes of participants to ICT use in school**

The findings indicated that the participants had a positive attitude to ICT use in school. It was found that of 44 participants, 95.5% (n=42) were in agreement – 22 (50%) agreed, and 20(45.5%) strongly agreed – that ICT should be used for students to retrieve information; 95.5% (n=42) were in agreement – 23 (52.3%) agreed and 19 (43.2%) strongly agreed – that ICT should be used for students to learn in an autonomous way; 95.5% (n=42) were in agreement – 18 (40.9%) agreed and 24 (54.5%) strongly agreed – that ICT use in teaching and learning is essential to prepare students to live and work in the 21st century; 95.5% (n=42) were in agreement – 23 (52.3%) agreed and 19 (43.2%) strongly agreed – that for ICT to be fully exploited for teaching and learning radical changes in nursing campus are needed; 93.2% (n=41) were in agreement – 24 (54.5%) agreed, and 17 (38.6%) strongly agreed – that ICT should be used for students to do exercises and practice; 90.9% (n=40) were in agreement – 22 (50.0%) agreed, and 18 (40.9%) strongly agreed – that ICT should be used for students to work in a collaborative way; 90.9% (n=40) were in agreement – 24 (54.5%) agreed and 16 (36.4%) strongly agreed – that ICT use in teaching and learning positively impacts on students' competence in transversal skills (learning to learn, social competencies, etc.); 88.6% (n=39) were in agreement – 23 (52.3%) agreed and 16 (36.4%) strongly agreed – that ICT use in teaching and learning positively impacts on students' motivation; 86.4% (n=38) were in agreement – 24 (54.5%) agreed and 14 (31.8%) strongly agreed – that ICT use in teaching and learning positively impacts on students' achievement; 84.1% (n=37) were in agreement – 20 (45.5%) agreed and 17 (38.6%) strongly agreed – that ICT use in teaching and learning positively impacts on students' higher order thinking skills (critical thinking, analysis, problem-solving).

Although the majority were positive in their attitude and in agreement with the use of ICT in school, the findings showed a small percentage who were in disagreement. It was found that of 44 participants, 15.9% (n=7) were in disagreement – 7 (15.9%) disagreed – that ICT use in teaching and learning positively impacts on students' higher order thinking skills (critical thinking, analysis, problem-solving); 13.6% (n=6) were in disagreement – 6 (13.6%) disagreed – that ICT use in teaching and learning positively impacts on students' achievement; 11.4% (n=5) were in disagreement – 5 (11.4%) disagreed – that ICT use in teaching and learning positively impacts on students' motivation; 9.1% (n=4) were in disagreement – 1 (2.3%) strongly disagreed and 3 (6.8%) disagreed – that ICT should be used for students to work in a

collaborative way; 9.1% (n=4) were in disagreement – 1 (2.3%) strongly disagreed and 3 (6.8%) disagreed – that ICT use in teaching and learning positively impacts on students’ competence in transversal skills (learning to learn, social competencies, etc.); 6.8% (n=3) were in disagreement – 1 (2.3%) strongly disagreed, and 2 (4.5%) disagreed – that ICT should be used for students to do exercises and practice; 4.5% (n=2) were in disagreement – 2 (4.5%) disagreed – that ICT should be used for students to retrieve information,; 4.5% (n=2) were in disagreement – 2 (4.5%) disagreed – that ICT should be used for students to learn in an autonomous way; 4.5% (n=2) were in disagreement – 1 (2.3%) strongly disagreed, and 1 (2.3%) disagreed – that ICT use in teaching and learning is essential to prepare students to live and work in the 21st century; 4.5% (n=2) were in disagreement – 1 (2.3%) strongly disagreed and 1 (2.3%) disagreed – that For ICT to be fully exploited for teaching and learning radical changes in nursing campus are needed (Table 4-16).

**Table 4-16: Attitudes of participants to ICT use in school (n=44)**

	Strongly Disagree		Disagree		Agree		Strongly Agree	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
ICT should be used for students to do exercises and practice	1	2.3	2	4.5	24	54.5	17	38.6
ICT should be used for students to retrieve information	0	0	2	4.5	22	50.0	20	45.5
ICT should be used for students to work in a collaborative way	1	2.3	3	6.8	22	50.0	18	40.9
ICT should be used for students to learn in an autonomous way	0	0	2	4.5	23	52.3	19	43.2
ICT use in teaching and learning positively impacts on students’ Motivation	0	0	5	11.4	23	52.3	16	36.4
ICT use in teaching and learning positively impacts on students’ Achievement	0	0	6	13.6	24	54.5	14	31.8
ICT use in teaching and learning positively impacts on students’ higher order thinking skills (critical thinking, Analysis, problem-solving)	0	0	7	15.9	20	45.5	17	38.6
ICT use in teaching and learning positively impacts on students’ competence in transversal skills (learning to learn, social competencies, etc.)	1	2.3	3	6.8	24	54.5	16	36.4
ICT use in teaching and learning is essential to prepare students to live and work in the 21st century	1	2.3	1	2.3	18	40.9	24	54.5
For ICT to be fully exploited for teaching and learning radical changes in nursing campus are needed	1	2.3	1	2.3	23	52.3	19	43.2

The overall score was calculated for teachers’ attitude to ICT use in school. Ten items listed above were considered. The teachers’ responses ranged from 1=strongly disagree, 2=Disagree, 3=Agree, to 4=strongly agree. A higher score indicated a positive attitude to ICT use in school,

and a lower score indicated a negative attitude to ICT use in school. The minimum score was 20, and the maximum score was 40. The mean score was 33.14, the standard deviation was 5.156, and the median was 32.50. The 1st quartile was 30, the 2nd quartile was 36 and the 3rd quartile was 39. This indicated the positive attitude of teachers to ICT use in school.

A Spearman's correlation was run to assess the relationship between teachers' attitude to the use of ICT at school and various variables. There were significant relationships between the following variables: highest qualification ( $r_s[44] = -.368$ ,  $p = .014$ ); number of the subjects taught ( $r_s[44] = -.419$ ,  $p = .005$ ); perceived nurse educators' skills in ICT ( $r_s[44] = .423$ ,  $p = .004$ ), and the positive impact of using ICT on student learning ( $r_s[44] = .474$ ,  $p = .001$ ).

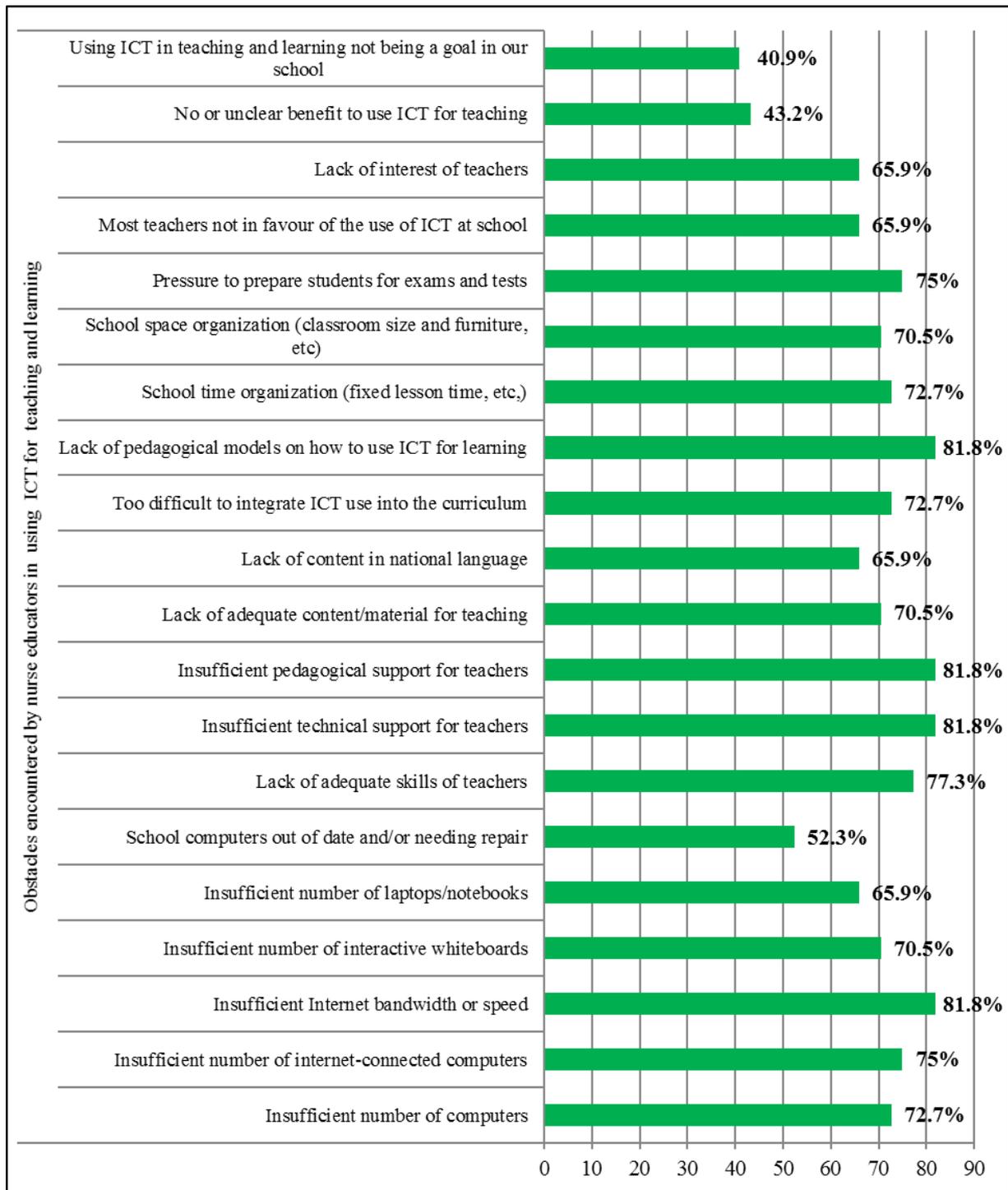
#### **4.5.15 Obstacles to use ICT in teaching and learning**

The findings revealed that participants had encountered obstacles in using ICT teaching and learning. These obstacles included: (i) Insufficient number of computers; (ii) Insufficient number of Internet-connected computers; (iii) Insufficient internet bandwidth or speed; (iv) Insufficient number of interactive whiteboards; (v) Insufficient number of laptops/notebooks; (vi) School computers out of date and/or needing repair; (vii) Lack of adequate skills of teachers; (viii) Insufficient technical support for teachers; (ix) Insufficient pedagogical support for teachers; (x) Lack of adequate content/material for teaching; (xi) Lack of content in national language; (xii) Too difficult to integrate ICT use into the curriculum (xiii) Lack of pedagogical models on how to use ICT for learning; (xiv) School time organisation (fixed lesson time, etc.); (xv) School space organisation (classroom size and furniture, etc.); (xvi) Pressure to prepare students for exams and tests; (xvii) Most teachers not in favour of the use of ICT at school; (xviii) Lack of interest of teachers; (xix) No or unclear benefit in using ICT for teaching; (xx) Using ICT in teaching and learning not being a goal in their school.

The findings indicated that many of the participants encountered problems in using ICT in teaching. Data was computed for these who met with obstacles and these who did not, irrespective of frequency. It was found that to some extent the majority had encountered obstacles ranging from a little to a lot. Of 44 participants, 81.8% (n=36) reported insufficient Internet bandwidth or speed; 81.8% (n=36) reported insufficient technical support for teachers; 81.8% (n=36) reported insufficient pedagogical support for teachers; 81.8% (n=36) reported lack of pedagogical models on how to use ICT for learning; 77.3% (n=34) reported lack of adequate skills of teachers; 75.0% (n=33) reported insufficient number of Internet-connected

computers; 75.0% (n=33) reported pressure to prepare students for exams and tests; 72.7% (n=32) reported insufficient number of computers; 72.7% (n=32) reported too difficult to integrate ICT use into the curriculum; 72.7% (n=32) reported school time organisation (fixed lesson time, etc.); 70.5% (n=31) reported insufficient number of interactive whiteboards; 70.5% (n=31) reported lack of adequate content/material for teaching; 70.5% (n=31) reported school space organisation (classroom size and furniture, etc.); 65.9% (n=29) reported insufficient number of laptops/notebooks; 65.9% (n=29) reported lack of content in national language; 65.9% (n=29) reported most teachers not in favour of the use of ICT at school; 65.9% (n=29) reported lack of interest of teachers; 52.3% (n=23) reported school computers out of date and/or needing repair; 43.2% (n=19) reported no or unclear benefit in using ICT for teaching; and 40.9% (n=18) reported using ICT in teaching and learning not being a goal in their school.

However a significant percentage, 59.1% (n=26), said using ICT in teaching and learning not being a goal in their school was not an obstacle at all, followed by 56.8% who said that no or unclear benefit of using ICT for teaching was not an obstacle at all (Figure 4-38).



**Figure 4-38: Obstacles to using ICT in teaching and learning encountered by nurse educators (n=44)**

**Table 4-17: Frequency of obstacles to using ICT in teaching and learning (n=44)**

	Not at all		A little		Partially		A lot	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Insufficient number of computers	12	27.3	13	29.5	13	29.5	6	13.6
Insufficient number of Internet-connected computers	11	25.0	12	27.3	13	29.5	8	18.2
Insufficient internet bandwidth or speed	8	18.2	13	29.5	10	22.7	13	29.5
Insufficient number of interactive whiteboards	13	29.5	9	20.5	9	20.5	13	29.5
Insufficient number of laptops/notebooks	15	34.1	10	22.7	11	25.0	8	18.2
School computers out of date and/or needing repair	21	47.7	10	22.7	7	15.9	6	13.6
Lack of adequate skills of teachers	10	22.7	16	36.4	10	22.7	8	18.2
Insufficient technical support for teachers	8	18.2	12	27.3	11	25.0	13	29.5
Insufficient pedagogical support for teachers	8	18.2	9	20.5	19	43.2	8	18.2
Lack of adequate content/material for teaching	13	29.5	8	18.2	15	34.1	8	18.2
Lack of content in national language	15	34.1	5	11.4	11	25.0	13	29.5
Too difficult to integrate ICT use into the curriculum	12	27.3	10	22.7	11	25.0	11	25.0
Lack of pedagogical models on how to use ICT for learning	8	18.2	9	20.5	14	31.8	13	29.5
School time organisation (fixed lesson time, etc.)	12	27.3	7	15.9	12	27.3	13	29.5
School space organisation (classroom size and furniture, etc.)	13	29.5	6	13.6	11	25.0	14	31.8
Pressure to prepare students for exams and tests	11	25.0	14	31.8	13	29.5	6	13.6
Most teachers not in favour of the use of ICT at school	15	34.1	10	22.7	11	25.0	8	18.2
Lack of interest of teachers	15	34.1	13	29.5	10	22.7	6	13.6
No or unclear benefit to use ICT for teaching	25	56.8	7	15.9	4	9.1	8	18.2
Using ICT in teaching and learning not being a goal in our school	26	59.1	10	22.7	5	11.4	3	6.8

A Spearman's correlation was run to assess the relationship between the obstacles to using ICT in teaching and learning and various variables. There were significant relationships between the following variables: having been a lecturer in the country ( $r_s [44] = -.302, p = .046$ ); working experience of the participants ( $r_s [44] = .368, p = .014$ ); and the school shared vision about ICT use ( $r_s [44] = .438, p = .003$ ).

An overall score was calculated for obstacles encountered by participants. Twenty items listed above were considered and responses ranged from 1=not at all; 2=a little; 3=partially; to 4=a lot. The higher the score, the more participants encountered the obstacles, the lower the score the fewer the participants who encountered obstacles. The minimum score was 20 and the maximum score was 72. The mean score was 47.30 and the standard deviation was 14.08. The 1st quartile was 36.25; the 2nd quartile was 48.5, and the 3rd quartile was 59. These findings

indicated that the majority of nurse educators encountered obstacles in using ICT for Teaching and Learning.

**Table 4-18: Summary of correlation between constructs related e-learning and nurse educators' characteristics (n=44)**

	CPS	GND	HOA	HQ	QNE	YWE	ALC	NST	NHTW	HTT	AMS	TSMC	ETT	PTT	CAI	PDT	TPD	STS	SVT	TBA	MUCI	OTTL	LAW2	PST	PITSL	ATTS
CPS	1.000	.389**	.208	-.328*	-.177	-.039	.150	-.377*	.153	.223	-.074	-.042	.135	.055	.111	.076	-.007	.195	.055	.017	.093	-.015	.225	.085	.284	.268
GND	.389**	1.000	-.154	.021	-.122	-.506**	.225	-.325*	-.073	-.201	-.094	-.261	-.104	-.103	-.053	.017	.199	.160	-.103	.021	.105	-.035	.083	-.017	.303*	.098
HOA	.208	-.154	1.000	.189	-.134	.564**	.087	-.060	.023	.056	-.277	.133	-.060	.256	.314*	-.006	-.007	.254	.155	-.156	.057	.062	.116	-.119	-.063	-.175
HQ	-.328*	.021	.189	1.000	.065	.070	-.005	.057	.053	-.024	-.181	-.100	-.239	.218	-.032	-.198	-.249	-.253	-.027	-.191	-.057	.033	.065	-.285	-.204	-.368*
QNE	-.177	-.122	-.134	.065	1.000	.048	.205	.184	.020	.057	.208	.022	-.099	-.049	-.280	-.309*	-.126	.118	.282	-.057	.196	.226	-.303*	-.084	-.028	-.181
YWE	-.039	-.506**	.564**	.070	.048	1.000	-.178	.071	.164	.057	.193	.382*	-.019	.184	.152	.037	-.128	.009	.335*	-.079	-.092	.368*	-.010	-.065	-.153	-.082
ALC	.150	.225	.087	-.005	.205	-.178	1.000	-.019	-.047	-.060	-.089	-.076	-.301*	-.174	-.128	-.078	-.076	.212	-.067	.120	.081	-.302*	.027	.044	.007	.043
NST	-.377*	-.325*	-.060	.057	.184	.071	-.019	1.000	-.135	-.101	.048	-.135	.138	.023	-.156	.204	.128	-.092	.020	.219	.053	-.067	-.238	-.007	-.478**	-.419**
NHTW	.153	-.073	.023	.053	.020	.164	-.047	-.135	1.000	.056	.159	-.086	-.169	.355*	-.052	.137	-.042	-.136	-.331*	-.157	.086	.172	.132	-.165	.113	.105
HTT	.223	-.201	.056	-.024	.057	.057	-.060	-.101	.056	1.000	.031	.224	.115	-.018	.188	-.018	-.307*	.192	.231	.137	-.227	.149	.305*	.176	.174	.290
AMS	-.074	-.094	-.277	-.181	.208	.193	-.089	.048	.159	.031	1.000	-.125	-.089	.144	-.129	-.129	-.158	-.323*	.047	-.064	.205	.141	-.172	-.285	-.150	-.031
TSMC	-.042	-.261	.133	-.100	.022	.382*	-.076	-.135	-.086	.224	-.125	1.000	.248	-.273	.308*	.263	.084	.410**	.183	.413**	-.258	.121	.164	.387**	-.013	.199
ETT	.135	-.104	-.060	-.239	-.099	-.019	-.301*	.138	-.169	.115	-.089	.248	1.000	-.197	-.128	.042	.012	.139	.066	.217	-.063	-.012	.163	.252	-.036	.116
PTT	.055	-.103	.256	.218	-.049	.184	-.174	.023	.355*	-.018	.144	-.273	-.197	1.000	-.015	-.169	-.015	-.085	-.080	-.426**	.179	.058	-.118	-.448**	-.025	-.227
CAI	.111	-.053	.314*	-.032	-.280	.152	-.128	-.156	-.052	.188	-.129	.308*	-.128	-.015	1.000	.163	.210	.095	.310*	.177	.044	.021	.046	.087	-.016	.150
PDT	.076	.017	-.006	-.198	-.309*	.037	-.078	.204	.137	-.018	-.129	.263	.042	-.169	.163	1.000	.572**	.222	-.160	.538**	-.305*	.112	.274	.341*	-.089	.169
TPD	-.007	.199	-.007	-.249	-.126	-.128	-.076	.128	-.042	-.307*	-.158	.084	.012	-.015	.210	.572**	1.000	.221	-.099	.200	.092	-.102	.119	.231	-.105	-.102
STS	.195	.160	.254	-.253	.118	.009	.212	-.092	-.136	.192	-.323*	.410**	.139	-.085	.095	.222	.221	1.000	.206	.296	-.186	.095	.254	.433**	.259	.185
SVT	.055	-.103	.155	-.027	.282	.335*	-.067	.020	-.331*	.231	.047	.183	.066	-.080	.310*	-.160	-.099	.206	1.000	-.081	.190	.438**	-.010	-.171	.010	.047
TBA	.017	.021	-.156	-.191	-.057	-.079	.120	.219	-.157	.137	-.064	.413**	.217	-.426**	.177	.538**	.200	.296	-.081	1.000	-.162	-.062	.295	.545**	-.074	.213
MUCI	.093	.105	.057	-.057	.196	-.092	.081	.053	.086	-.227	.205	-.258	-.063	.179	.044	-.305*	.092	-.186	.190	-.162	1.000	-.099	-.050	-.361*	-.118	-.219
OTTL	-.015	-.035	.062	.033	.226	.368*	-.302*	-.067	.172	.149	.141	.121	-.012	.058	.021	.112	-.102	.095	.438**	-.062	-.099	1.000	.066	-.148	-.052	.060
LAW2	.225	.083	.116	.065	-.303*	-.010	.027	-.238	.132	.305*	-.172	.164	.163	-.118	.046	.274	.119	.254	-.010	.295	-.050	.066	1.000	.168	.220	.234
PST	.085	-.017	-.119	-.285	-.084	-.065	.044	-.007	-.165	.176	-.285	.387**	.252	-.448**	.087	.341*	.231	.433**	-.171	.545**	-.361*	-.148	.168	1.000	.126	.423**
PITSL	.284	.303*	-.063	-.204	-.028	-.153	.007	-.478**	.113	.174	-.150	-.013	-.036	-.025	-.016	-.089	-.105	.259	.010	-.074	-.118	-.052	.220	.126	1.000	.474**
ATTS	.268	.098	-.175	-.368*	-.181	-.082	.043	-.419**	.105	.290	-.031	.199	.116	-.227	.150	.169	-.102	.185	.047	.213	-.219	.060	.234	.423**	.474**	1.000

\* p< .005 level (2-tailed). \*\*p< .001 level (2-tailed).

**Note:** CP: Campus; GND: Gender; HOA: Age; HQ: Highest qualification; QNE: Qualification in nursing education; YWE: Years of working experience; ALC: Always having been a lecturer in the country; NST: Number of the subjects taught by the participants; NHTW: Number of hours per a week, the participants teach in their target classes; HTT: How ICT is taught to the target class; AMS: Extent of availability of ICT related to the students; TSMC: Teaching strategies are used in your micro curriculum; ETT: Experience with ICT for teaching in the last 12 months; PTT: Percentage of time spent using ICT; CAI: Condition of access to infrastructure in the target class; PDT: Professional development in ICT in the past 2 Years; TPD: Time spent in professional development opportunities; STS: Source and the type of support; SVT: School shared vision about ICT use; TBA: ICT-based activities and material used for teaching; OTTL: Obstacles to using ICT in teaching and learning; LAW2: Learning activities in the target class with or without ICT; PST: Perceived skills in ICT; PITSL: Positive

## **4.6 FINDINGS FROM QUANTITATIVE DATA SET THREE: ICT MANAGER RESPONDENTS**

### **4.6.1 Sociodemographic characteristics of ICT managers**

The sociodemographic data included in this study were campus, age, gender, highest qualification, qualification in ICT or computer science, years of experience as an ICT manager.

#### **4.6.1.1 Age of the ICT Managers**

Two ICT managers participated in this study; minimum age was 32 years and maximum age was 35 years. The mean age was 33.50 and the standard deviation was 2.121.

#### **4.6.1.2 Gender of ICT managers**

Both of the ICT managers who participated in this study were male (100%; n=2).

#### **4.6.1.3 Highest qualification of ICT managers**

Both of the ICT managers who participated in this study had a bachelor's' degree (100%; n=2).

#### **4.6.1.4 Qualification in ICT or computer science**

Both of the ICT managers who participated in this study had a qualification in ICT or computer science (100%; n=2).

#### **4.6.1.5 Years of experience as ICT managers**

In years of working experience as ICT managers, the minimum was 4 years and the maximum 8 years. The standard deviation was 2.828.

**Table 4-19: Sociodemographic profile of ICT managers (n=2)**

	VARIABLES	FREQ.	%
Campus	Campus B	1	50
	Campus C	1	50
Gender	Males	2	100
	Females	0	0.0
Age category	30-34 year old	1	50
	35-40years old	1	50
Highest qualification of the participants	Master's degree	0	0.0
	Honour's degree	0	0.0
	Bachelor's degree	2	100
	Diploma	0	0.0
Qualification in ICT or computer science	Yes	2	100
	No	0	0.0
Number of working years' experience	1-5 years	1	50
	6-10 years	1	50

#### 4.6.2 Owning a computer in the office at the institution

Both the ICT managers who participated in the study reported owning computers in their offices (100%; n=2).

##### 4.6.2.1 Types of the computers owned by ICT managers

Of the two ICT managers who participated in the study (50%; n=1) had a laptop, and (50%; n=1) had both desktop and a laptop.

#### 4.6.3 Number of the computers available to students for educational purposes in the campuses of ICT managers

The ICT manager from campus B reported having a total of 70 computers (25 in the computer laboratory and 45 in the other areas accessible to students). The ICT manager from campus C reported having in total 45 computers (40 in the computer laboratory and 5 in the school library).

#### 4.6.4 Other ICT devices available for educational purposes

It was found that a number of ICT devices were available for academic purposes. These devices included internet-connected laptops, tablet PCs, netbooks or mini-notebooks; digital readers (portable device to read books, newspapers, etc. on screen); interactive whiteboards; digital cameras; data projectors. The ICT manager from Campus B reported that they had four Internet-connected laptops, eight interactive whiteboards and six data projectors. The ICT

manager from campus C reported that for all three levels (first, second and third year) they had the following: Internet-connected laptops, tablet PCs, netbooks or mini-notebooks, digital readers, data projectors, and Interactive whiteboards for level one For Campus C no number were reported for these devices.

#### **4.6.5 Proportions of the equipment are fully operational (computers, interactive whiteboards, laptops, data projectors)**

The ICT manager from Campus B reported that more than 90% of the equipment such as computers, interactive whiteboards, laptops, data projectors was in use, and at Campus C, the ICT manager reported that between 76% and 90% was in use.

#### **4.6.6 Internet speed of Internet which the school and means of access to Internet,**

Both ICT managers (100%) who participated in the study indicated that Internet speed was between 10mbps (excl.) and 30mbps (incl.). Both ICT managers (100%) indicated that access to the internet was via fibre optic.

#### **4.6.7 Maintenance of ICT equipment**

Both ICT managers (100%) who participated in this study indicated that the maintenance of ICT equipment was done by ICT managers.

#### **4.6.8 Internet and virtual learning environment connectedness of the school**

Both ICT managers who participated in this study (100%; n=2) reported that the schools had their own homepages or websites which were publicly accessible; 100% (n=2) reported that there were school email addresses for more than 50% of teachers; 100% (n=2) reported that there were school email addresses for more than 50% of students; 100% (n=2) reported that there were LANs (local area networks); 100% (n=2) reported that there were wireless networks (Wi-Fi); 100% (n=2) reported that there was a virtual learning environment (i.e. platform or knowledge management system, etc. – possibly hosted externally); 100% (n=2) reported that there was a virtual learning environment that could be accessed by the students from outside the school; 100% (n=2) reported that there was a virtual learning environment that could be accessed by the teachers from outside the school; 100% (n=2) reported that there was a virtual learning environment that could be accessed by the public from outside the school; 100% (n=2)

reported that there was virtual learning environment that could be accessed outside of school hours.

#### **4.6.9 Types of the technology available in the classrooms**

The ICT managers reported that a number of technology tools were available in the classrooms. These included personal computers, interactive whiteboards, video conferencing systems, audio equipment (including software), digital photo cameras (including editing software), digital video cameras (including editing software), mobile phones, and projection systems. It was indicated that some of this equipment was available in some classrooms, some in all classrooms, some on request, and some not available at all in any classroom.

Regarding personal computers, one ICT manager reported that these were available in all classrooms (Campus B) while the ICT manager from campus C reported that they were available upon request. Both ICT managers (100%; n=2) reported that interactive whiteboards were available in all classrooms. Both ICT managers (100%; n=2) reported also that video conferring equipment was available in some classrooms. Both (100%; n=2) reported that audio equipment (including software) was available on request. One ICT manager (Campus C) who responded to the questions regarding digital photo cameras (including editing software) reported that these were not available at all in classrooms. Both ICT managers (100%; n=2) reported that digital video cameras (including editing software), and mobile phones were not available at all in classrooms. Both ICT managers (100%; n=2) reported that projectors were available in all classrooms.

#### **4.6.10 Technological support for ICT managers from the institution and quality of the support**

Both ICT managers (100%; n=2) reported that technological support was available for ICT managers at their institutions. Both (100%; n=2) reported that the quality of support they got was good.

#### **4.6.11 ICT managers' perception of the importance of technology use for nurse educators**

The ICT managers who participated in this study reported a number of activities and their level of importance for nurse educators in using technology. These activities include: (i) use of technology for communicating and/or networking with their students; (ii) use of technology for

communicating and/or networking with relatives; (iii) use of technology for communicating and/or networking with school management and educational administrations; (iv) use of technology for nurse educators' own development and learning; (v) use of technology as a management tool for organising their work and keeping records; (vi) use of technology as a management tool for preparing lessons; (vii) use of technology as a management tool for finding digital learning resources; (viii) use of technology as a management tool for designing and producing their own digital learning resources, (ix) future incorporation, by nurse educators, of technology to facilitate teaching specific concepts or skills; (x) future incorporation, by nurse educators, of technology to support various student learning styles and to personalize learning; (xi) future incorporation, by nurse educators, of technology to facilitate teaching students with disabilities (cognitive, physical, behavioural); (xii) future incorporation, by nurse educators, of technology to support activities that facilitate higher-order thinking; (xiii) future incorporation, by nurse educators, of technology to support creativity; (xiv) future incorporation, by nurse educators, of technology to foster students' ability to use technology in their own learning.

Of the two ICT managers who participated in this study (100%; n=2) reported that it was very important to use technology for communicating and/or networking with their students (100%; n=2) reported that it was very important to use technology for nurse educators' own development and learning; 100% (n=2) reported that it was very important to use technology as a management tool for organising their work and keep records; 100% (n=2) reported that it was very important to use technology as a management tool for preparing lessons; 100% (n=2) reported that it was very important to use technology as a management tool for designing and producing their own digital learning resources. In addition, (50%; n=1) reported that it was very important to use technology for communicating and/or networking with school management and educational administrations; (50%; n=1) reported that it was very important to use technology as a management tool for finding digital learning resources; (50%; n=1) reported that future incorporation of technology by nurse educators was very important to facilitate teaching specific concepts or skills; (50%; n=1) reported that future incorporation of technology by nurse educators was very important to support various student learning styles and to personalize learning; (50%; n=1) reported that future incorporation of technology by nurse educators was very important to facilitate teaching students with disabilities (cognitive, physical, behavioural); (50%; n=1) reported that future incorporation of technology by nurse educators was very important to support activities that facilitate higher-order thinking; (50%;

n=1) reported that future incorporation of technology by nurse educators was very important to support creativity; (50%; n=1) reported that future incorporation of technology by nurse educators was very important to foster students' ability to use technology in their own learning; (50%; n=1) reported it was very important to use technology for communicating and/or networking with relatives.

Both ICT managers perceived a level of importance (quite important, or a little important) for some ICT activities. One manager (50%; n=1) reported that it was quite important to use technology for communicating and/or networking with relatives; one manager (50%; n=1) reported that it was quite important to use technology for communicating and/or networking with school management and educational administrations; one manager (50%; n=1) reported that it was quite important to use technology as a management tool for finding digital learning resources; one manager (50%; n=1) reported that future incorporation of technology by nurse educators was quite important for facilitating teaching specific concepts or skills; one manager (50%; n=1) reported that future incorporation of technology by nurse educators was quite important for supporting various student learning styles and personalising learning; one manager (50%; n=1) reported that future incorporation of technology by nurse educators was quite important for facilitating teaching students with disabilities (cognitive, physical, behavioural); one manager (50%; n=1) reported that future incorporation of technology by nurse educators was quite important for supporting creativity; one manager (50%; n=1) reported that future incorporation of technology by nurse educators was quite important for fostering students' ability to use technology in their own learning, and one manager (50%; n=1) reported that future incorporation of technology by nurse educators was a little important for supporting activities that facilitate higher-order thinking. These findings indicate that overall ICT managers had a positive perception of the importance for the nurse educators of using technology.

#### **4.6.12 Level of importance for nursing students to use technology, as perceived by ICT managers**

The ICT managers who participated in this study indicated a number of activities and their level of importance in use of technology by nursing students: (i) For communication with their teachers; (ii) For communication with relatives; (iii) For communication with school management and educational administrations; (iv) For own development and learning; (v) For organising their work and keeping records; (vi) For preparing lessons; (vii) For finding digital

learning resources; (viii) For designing and producing their own digital learning resources; (ix) To facilitate learning specific concepts or skills; (x) To support fellow students and to personalize learning; (xi) To facilitate learning for students with disabilities (cognitive, physical, behavioural); (xii) To support activities that facilitate higher-order thinking; (xiii) To support creativity; (xiv) To foster students' ability to use technology in their own learning.

Both ICT managers (100%; n=2) who participated in the study attributed high importance to the use of ICT by nursing students; both (100%; n=2) reported that it was very important for students to use ICT to communication with school management and educational administrations; both (100%; n=2) reported that it was very important for students to use ICT for organising their work and keep records; both (100%; n=2) reported that it was very important for students to use ICT to Use for own development and learning; both (100%; n=2) reported that it was very important for students to use ICT for finding digital learning resources.

In addition, one manager (50%; n=1) reported that it was very important, and one (50%; n=1) that it was quite important, for students to use ICT to Communication with their teachers; one (50%; n=1) reported that it was very important, and one (50%; n=1) that it was quite important, for students to use ICT for preparing lessons; one (50%; n=1) reported that it was very important, and one (50%; n=1) that it was quite important, for students to use ICT for designing and producing their own digital learning resources; one (50%; n=1) reported that it was very important, and one (50%; n=1) that it was quite important, for students to use ICT to facilitate learning specific concepts or skills; one (50%; n=1) reported that it was very important, and one (50%; n=1) that it was quite important, for students to use ICT to support fellow students and to personalize learning.

One (50%; n=1) reported that it was very important, and one (50%; n=1) that it was quite important, for students to use ICT to support activities that facilitate higher-order thinking; one (50%; n=1) reported that it was very important, and one (50%; n=1) that it was quite important, for students to use ICT to foster students' ability to use technology in their own learning; one (50%; n=1) reported that it was very important, and one (50%; n=1) that it was quite important, for students to use ICT to communicate with relatives; one (50%; n=1) reported that it was very important, and one (50%; n=1) that it was a little important, for students to use ICT to support creativity; (50%; n=1) reported it is very important, and (50%; n=1) reported that it was a little important for students to use ICT to facilitate learning for students with disabilities (cognitive, physical, behavioural).

#### **4.6.13 ICT-related activities taught to nurse educators by ICT managers, and their frequency**

ICT managers who participated in the study reported a number of ICT-related activities that were taught, with varying frequency, to nurse educators: (i) Personal computers; (ii) Interactive whiteboards; (iii) Video conferencing systems; (iv) Learning Management Systems/VLE (Web CT, Moodle etc.); (v) Audio equipment (including software); (vi) Digital photo cameras (including editing software); (vii) Digital video cameras (including editing software); (viii) Mobile phones; (ix) Projection systems.

Both ICT managers (100%; n=2) reported sporadically teaching nurse educators about personal computers, interactive whiteboards, video conferencing systems, and mobile phones. Regarding teaching nurse educators about learning management systems/VLE (Web CT, Moodle etc.), one ICT manager (50%) reported teaching it in every class, and one (50%; n=1), did so sporadically. On teaching nurse educators about audio equipment, including software, one ICT manager (50%) reported doing so in half of the classes while (50%; n=1) reported doing so sporadically. One ICT manager (50%) reported having sporadically taught digital photo cameras (including editing software) to nurse educators, the other did not respond to the question. One of the ICT managers (50%; n=1) reported having sporadically taught nurse educators about digital video cameras (including editing software), and the other (50%) had never done so. Regarding teaching nurse educators about the projection systems, one ICT manager (50%) reported having done so in every class, while another ICT manager (50%) reported having done so sporadically.

#### **4.6.14 ICT-related activities taught to nursing students by ICT managers, and their frequency**

ICT managers who participated in the study reported a number of ICT-related activities that were taught, with varying frequency, to nursing student: (i) Personal computers; (ii) Interactive whiteboards; (iii) Video conferencing systems; (iv) Learning Management Systems/VLE (Web CT, Moodle etc.); (v) Audio equipment (including software); (vi) Digital photo cameras (including editing software); (vii) Digital video cameras (including editing software); (viii) Mobile phones; (ix) Projection systems.

Both ICT managers (100%; n=2) reported having taught students in every class about personal computers, learning management system/ VLE (Web CT, Moodle, etc.), and the projection systems. One ICT manager (50%) reported having taught nursing students in every class about

interactive whiteboards, while the other (50%) reported doing so in about half of the classes; one ICT manager (50%) who responded on teaching video conferencing system to nursing students, reported doing so in every class. One manager (50%) reported having taught nursing students in every class about the use of audio equipment, including software, while the other ICT manager reported having done so in about half of the classes. Use of digital photo cameras, including editing software, was reported by one ICT manager (50%) to have been taught to nursing students in every class, while the other ICT manager (50%) reported having done so in about half of the classes. Use of digital cameras and digital video cameras including editing software was reported by one ICT manager (50%) to have been taught to nursing students in every class, while the other ICT manager reported having done so in about half of the classes. Regarding the use of mobile phones, one of two ICT managers (50%) reported having taught it to nursing students in about half of the classes while the other ICT manager reported having done so sporadically.

#### **4.6.15 Suggestions and assessments by ICT managers on incorporation of technology in education**

ICT managers who participated in the study made a number of suggestions for increasing the incorporation of technology in education. These related to (i) better access to technological equipment, (ii) reliability of equipment, (iii) availability of high-quality equipment, (iv) training/courses in pedagogical use of ICT, (v) pedagogical ICT-support (e.g. “hotline”), (vi) technological hands-on training/courses, (vii) technological support (e.g. “hotline”), (viii) policies on using ICT across the curriculum, (ix) time to prepare, explore and develop, (x) task-related incentives (salary, promotion etc.).

Both ICT managers who participated in this study (100%; n=2) reported that it was very important to have training/courses in the pedagogical use of ICT, pedagogical ICT-support (e.g. “hotline”), technological hands-on training/courses, and task-related incentives (salary, promotion etc.). Both ICT managers (n=2) reported that it was quite important to have better access to technological equipment, reliable equipment, availability of high-quality equipment, policies on using ICT across the curriculum, and time to prepare, explore and develop. One of the two ICT managers (50%) reported that it was quite important to have technological support, while the other ICT manager (50%) regarded it as having a little importance.

## **4.7 FINDINGS FROM QUANTITATIVE DATA SET FOUR: CAMPUS MANAGER RESPONDENTS**

Two campus managers, from two of the three campuses of the selected nursing school in Rwanda, responded to the questionnaires.

### **4.7.1 Social demographic characteristics of the campus managers**

The sociodemographic data included in this study were campus, age group, gender, highest qualification, qualification in nursing education, years of experience as a campus manager.

#### **4.7.1.1 Age of the Campus Managers**

Of the two campus managers who participated in this study, one was in the 30 to 40 years age group and the other one was in the 40 to 50 years age group.

#### **4.7.1.2 Gender of campus managers**

Of two campus managers who participated in this study, one was male (50%; n=1), and one was female (50%; n=1).

#### **4.7.1.3 Highest qualification of campus managers**

Of the two campus managers who participated in this study, one had a bachelors' degree (50%; n=1), and the other had a master's degree.

#### **4.7.1.4 Qualification in nursing education**

Both the campus managers who participated in this study had a qualification in nursing education (100%; n=2).

#### **4.7.1.5 Years of experience as campus managers in the institution**

One campus manager (50%; n=1) had less than 3 years' working experience as a campus manager and one (50%; n=1) had 21 years or more of working experience. The campus manager who had 21 or more years of working experience, reported also working as the head teacher, including 21 or more years in the present institution, and also reported having worked for 21 or more years in any professional capacity in any school.

**Table 4-20: Sociodemographic characteristics of campus managers (n=2)**

	<b>Variables</b>	<b>Freq.</b>	<b>%</b>
Campus	Campus B	1	50%
	Campus C	1	50%
Gender	Males	1	50%
	Females	1	50%
Age category	30-40 year old	1	50%
	40-50 years old	1	50%
Highest qualification of the participants	Master's degree	1	50%
	Bachelor's degree	1	50%
Qualification in nursing education	Yes	2	100%
	No	0	0.0%
Number of working years' experience	Less than 3 years	1	50%
	21 years or more	1	50%

#### **4.7.2 Purposes for which campus managers use computers and Internet**

The findings revealed that both campus managers who participated in this study (100%) used computers for school management-related tasks (budgeting, planning, timetabling, etc.), searching for information, making presentations, communicating online with teachers (email, website announcements, etc.), and communicating by emails with educational authorities (at local, regional, or central level). One of the two campus managers (50%; n=1) reported that computer and the internet were used for communicating online with parents (email, website announcements, etc.), while the other reported it was not applicable.

#### **4.7.3 Support provided to teachers in using ICT for professional development**

The findings indicated that teachers, to varying degrees, undertook professional development in various areas during the previous two academic years. These areas included: (i) Advanced courses on Internet use (creating websites/home page, video conferencing, etc.), (ii) Equipment-specific training (interactive whiteboard, laptop, etc.); (iii) Courses on the pedagogical use of ICT in teaching and learning; (iv) Subject-specific training on learning applications (tutorials, simulations, etc.); (v) Courses on multimedia (using digital video, audio equipment, etc.); (vi) Participation in peer-learning communities or group work with other teachers about the use of ICT for learning and teaching; (vii) Other professional development opportunities related to ICT; (viii) Developing online materials; (ix) Facilitating online learning; (x) Conducting online assessment.

However, it was also noted by both campus managers (100%; n=2) that none of the teachers had undertaken professional development in the previous two academic years in the following areas: (i) Introductory courses on Internet use and general applications (basic word-processing,

spreadsheets, presentations, databases, etc.); (ii) Advanced courses on applications (advanced word-processing, complex relational databases, virtual learning environment etc.).

One of the two campus managers (50%; n=1) reported that more than 50% of the teachers had undergone courses on pedagogical use of ICT in teaching and learning, while the other (50%; n=1) reported that only 25% or fewer of the teachers had had the benefit of these courses.

Regarding subject-specific training on learning applications (tutorials, simulations, etc.), one of the two managers (50%; n=1) reported that more than 50% of the teachers received the training on learning applications, while the other campus manager (50%; n=1) reported that only 25% or fewer of the teachers had had the benefit of this training. As reported by one campus manager (50%; n=1), more than 50% of the teachers received training on developing online materials, while the other campus manager (50%; n=1) reported that 25% or fewer of the teachers had been trained in that area.

One of the two campus managers (50%; n=1) reported that a number of teachers (between 26% and 50% of the teachers) received training in facilitating online learning, while the other campus manager (50%; n=1) reported that only 25% or fewer had had the benefit of such training. Similarly, as reported by one campus manager (50%; n=1), 26% to 50% of the teachers received training on conducting online assessment while the other campus manager reported 25% or fewer of the teachers had been trained in that area. Both the campus managers (100%; n=2) reported that only 25% or fewer had undergone other professional development opportunities related to ICT.

It was further noted that there were areas where teachers at one campus received training that was not done at the other campus. One campus manager (50%; n=1) reported that only 25% or fewer of the teachers received advanced courses on Internet use (creating websites/home page, video conferencing, etc.), while the other campus manager (50%; n=1) reported that none of the teachers had been trained in that area. One campus manager (50%; n=1) reported that more than 50% of the teachers had received equipment-specific training while the other campus manager (50%; n=1) reported that none of the teachers had been trained in that area. The findings further indicated that one campus manager (50%; n=1) reported that 26% to 50% of the teachers received a course on multimedia (using digital video, audio equipment, etc.), while the other campus manager (50%; n=1) reported that none of the teachers had been given that course. Twenty-five per cent or fewer of the teachers participated in peer learning communities or group work with other teachers on the use of ICT for learning and teaching, as reported by

one campus manager, while the other campus manager (50%; n=1) reported that none of the teachers had been given that opportunity.

#### **4.7.4 Availability of ICT coordinators, and rewards and responsibilities at the campuses**

Both campus managers who participated in this study (100%; n=2) reported that their campuses had ICT coordinators who were available full-time at their campus, and both campus managers (100%; n=2) reported that these ICT coordinators were given concrete rewards for this function (e.g. increase in salary, reduction of workload, prizes, etc.). Both campus managers (100%; n=2) reported that these ICT coordinators had responsibilities to provide support in the pedagogical use of ICT at their campuses.

#### **4.7.5 Obstacles to ICT use in teaching and learning**

The findings indicated that various obstacles had to some extent affected the use of ICT in teaching and learning. These obstacles included (i) Insufficient number of computers; (ii) Insufficient internet bandwidth or speed; (iii) Insufficient number of interactive whiteboards; (iv) Insufficient number of laptops/notebooks; (v) School computers out of date and/or needing repair; (vi) Lack of adequate skills of teachers; (vii) Insufficient technical support for teachers; (viii) Insufficient pedagogical support for teachers; (ix) Lack of adequate content/material for teaching; (x) Lack of content in national language; (xi) Too difficult to integrate ICT use into the curriculum; (xii) Lack of pedagogical models on how to use ICT for learning; (xiii) School time organisation (fixed lessons time, etc.); (xiv) School space organisation (classroom size and furniture, etc.); (xv) Pressure to prepare students for exams and tests.

Both campus managers (100%; n=2) reported that the following were not among the obstacles to ICT use in teaching and learning at their campuses: (i) Insufficient number of internet-connected computers; (ii) Most parents not in favour of the use of ICT at school; (iii) Most teachers not in favour of the use of ICT at school; (iv) No benefit or unclear benefit in using ICT for teaching; (v) Using ICT in teaching and learning not being a goal in our school.

Regarding the obstacles that have to some extent affected the use of ICT in teaching and learning, one campus manager (50%; n=1) reported that they had been affected a lot by lack of pedagogical models on how to use ICT for learning, while the other (50%; n=1) reported that they had been affected a little. One of the campus managers (50%; n=1) reported that they were

affected a lot by school space organisation (classroom size and furniture, etc.), while the other (50%; n=1) reported that they were affected a little. Pressure to prepare students for exams and tests was reported as a problem, and one campus manager (50%; n=1) reported they were affected by it a lot, while the other campus manager (50%; n=1) reported it was not a problem at all.

Both campus managers (100%; n=2) reported they were affected to an extent by the following obstacles: insufficient technical support for teachers; insufficient pedagogical support for teachers, lack of adequate content/material for teaching. Both campus managers (100%; n=2) reported that they were affected a little by school computers being out of date and/or needing repair. One campus manager (50%; n=1) reported that they were affected to some extent by school time organisation (fixed lesson times, etc.), while the other (50%; n=1) reported that they were affected by it a little. Similarly, one campus manager (50%; n=1) reported they were affected to some extent by the lack of adequate skills of teachers, while the other (50%; n=1) reported that they were affected by it a little.

The insufficient number of computers was reported as an obstacle to some extent by one campus manager (50%; n=1) while the other (50%; n=1) reported they were not at all affected by the insufficient number of computers. Insufficient internet bandwidth or speed was also reported to be an obstacle to a little extent by one campus manager (50%; n=1) while the other (50%; n=1) said it was not an obstacle at all. Similarly, the insufficient number of interactive whiteboards was considered as an obstacle to some extent by one campus manager (50%; n=1), while the other (50%; n=1) reported it was not an obstacle at all. One campus manager (50%; n=1) reported that the insufficient number of laptops/notebooks was a problem to a little extent in using ICT in teaching and learning while the other (50%; n=1) said it was not a problem at all.

Lack of content in national language was reported as an obstacle to a little extent in use of ICT in teaching and learning by one campus manager (50%; n=1) whereas the other (50%; n=1) reported it was not an obstacle at all. One campus manager (50%; n=1) reported that it was a little too difficult to integrate ICT use into the curriculum, while another one (50%; n=1) said it was not at all too difficult to integrate ICT use into the curriculum.

#### **4.7.6 Institutional strategies to use ICT in teaching and learning**

It was found that a number of strategies for use of ICT in teaching and learning were in place at two campuses which participated in this study. These strategies included (i) Its own written statement specifically about the use of ICT for pedagogical purposes; (ii) Policy and actions for use of ICT for teaching and learning in specific subjects; (iii) Regular discussions with teaching staff about ICT use for pedagogical purposes; (iv) A specific policy or programme to prepare students for responsible Internet behaviour; (v) A specific policy to promote cooperation and collaboration among teachers. Each of these strategies was reported by one or both of the campus managers.

Although the campus managers reported a number of strategies for ICT use in teaching and learning, there were strategies that campuses did not have and which are crucial in the use of ICT in teaching and learning. Both campus managers (100%; n=2) reported the following gaps at their institutions: (i) no institutional written statement about the use of ICT; (ii) no specific policy about using social networks (Facebook, etc.) in teaching and learning; (iii) no scheduled time for teachers to meet to share, evaluate or develop instructional materials and approaches.

Both campus managers (100%; n=2) reported having regular discussions with teaching staff about ICT use for pedagogical purposes. Both campus managers (100%; n=2) also reported having a specific policy or program to prepare students for responsible Internet behaviour. One of the two campus managers (50%; n=1) reported that the campus had its own written statement specifically about the use of ICT for pedagogical purposes, whereas the other campus manager (50%; n=1) reported not having such a written statement. One campus manager (50%; n=1) reported that the campus had policy and actions for use of ICT for teaching and learning in specific subjects, while the other (50%; n=1) reported not having such a policy. One campus manager (50%; n=1) reported that the campus had a specific policy for promoting cooperation and collaboration among teachers, and the other campus manager (50%; n=1) reported not having such a policy.

#### **4.7.7 Incentives provided by the campuses to reward teachers for using ICT in teaching and learning**

Both campus managers (100%; n=2) reported that teachers were not given rewards or incentives for using ICT in teaching and learning such as (i) financial incentives (bonus, increase in salary); (ii) reduced number of teaching hours; (iii) competitions and prizes; or (iv)

additional ICT equipment for the classroom. However, one campus manager (50%) reported that teachers were given additional training hours as reward or incentive for using ICT in teaching and learning, and also that the institution not being able to reward or give incentives to the teachers was related to budget issues.

#### **4.7.8 Innovation policy (not necessarily related to ICT)**

The findings indicated that there were innovative policies on campuses not necessarily related to ICT. These included: (i) Initiatives to encourage such innovations within the school (even in the absence of a policy statement); (ii) Change in management training programs (any time during the last three years).

Both campus managers (100%; n=2) reported having initiatives to encourage such innovations within the school (even in absence of a policy statement). One campus manager (50%; n=1) reported having made changes in management training programs in the past three years, while the other campus manager (50%; n=1) reported that there was no such change in managing training program anytime during the same period. However, both campus managers (100%; n=2) reported that there was no official policy statement about innovation within the school in teaching and learning methods and/or school organisation more generally.

#### **4.7.9 Opinions of campus managers about ICT use for educational purposes**

Both campus managers (100%; n=2) strongly agreed that computers and the Internet should be used for students to do exercises and practice, to retrieve information, to work in a collaboratively, and to learn autonomously.

Both campus managers (100%; n=2) strongly agreed that ICT use in teaching and learning impacts positively on student's motivation, achievement, higher-order thinking skills (critical thinking, analysis, problem-solving), and competence in transversal skills (learning to learn, social competencies, etc. Both campus managers (100%; n=2) strongly agreed that the use of ICT in teaching and learning was essential to prepare students to live and work in the 21st century and that radical changes at the nursing campus were needed for ICT to be fully exploited for teaching and learning.

#### **4.7.10 Institutional autonomy in pedagogical and ICT decision making**

The findings showed that the campuses had autonomy in pedagogical and ICT decision-making such as: (i) procuring ICT infrastructure, (ii) determining course content, (iii) choosing teaching methods, (iv) deciding about teacher training, (v) choosing learning resource. It was also noted that in regard to this autonomy various bodies or groups of individuals had to take responsibility for one item or another of those mentioned above, including teachers, ICT managers, head of the school, school educational governing body authority, and national educational authority.

In relation to procuring ICT infrastructure one of the two ICT managers (50%; n=1) reported that the teachers were involved in procuring ICT infrastructure; one (50%; n=1) said it was the responsibility of ICT managers; one (50%; n=1) said it was the responsibility of the school governing body authority; one (50%; n=1) said it was the responsibility of the head of the school, and both (100%; n=2) said that it was not the responsibility of the national educational authority.

In determining the course contents, both managers (100%; n=2) reported that teachers and the national educational authority were involved. They both also reported that ICT managers were not involved in determining the course content. In addition, one campus manager (50%; n=1) reported that the school governing body authority was involved in determining course content, and one (50%; n=1) reported that the head of the school was involved.

Regarding who is responsible for choosing the teaching methods, both campus managers (100%; n=2) reported that teachers and the national educational authority were mainly responsible, and both reported that it was not the responsibility of the ICT managers. In addition, one campus managers (50%; n=1) reported that the school governing body authority was responsible, one (50%; n=1) reported that the head of the school was responsible, and (50%; n=1) reported others such as curriculum developers as being responsible.

In deciding about the training for teachers, both campus managers (100%; n=2) reported that teachers, school educational governing body, the head of the school, and the national educational authority were mainly responsible. One of the campus managers (50%; n=1) reported that ICT managers and others, such as founders were also responsible for deciding on training for teachers.

In regard to choosing learning resources, both campus managers (100%; n=2) reported that it was mainly the responsibility of the teachers, head of the school, and the national educational authority. Both campus managers (100%; n=2) also said that ICT managers were not responsible for choosing the learning resources; one (50%; n=1) reported that the school educational governing body was responsible, and one (50%; n=1) reported that others such as the Ministry of Health and the Ministry of Education were also responsible for choosing learning resources for the school.

## **4.8 FINDINGS FROM THE QUALITATIVE PHASE**

### **4.8.1 Introduction**

This section presents the findings from qualitative data. Data was analysed using grounded theory. Strauss and Corbin's (1990) grounded theory framework for analysing qualitative data was adopted to develop a theory rather than to test one. Conceptualisation of the core phenomenon is one the element of the grounded theory framework that was used in this study. In this study, the grounded theory analysis was done by going through the interviews and then open, axial and selective coding processes provided a directional analytic strategy. Data was analysed using multiple sources such as in-depth interviews, focus group discussion, documents analysis, Moodle analysis based on the log reports, course blogs, notes, activity reports, course participations, activity completion, statistics, interface design of Moodle, and troubleshoots of Moodle in general. In order to keep a record of the gathered information, screen shots were taken continuously for a period of three months, combined with reflective journals and memos. All these data sources were analysed to better understand the phenomenon as it occurs in Rwanda.

To reiterate, this study had two aims which were to analyse the use of an e-learning platform at a selected nursing school in the context of Rwanda, and to develop a middle-range theory that would facilitate the use of e-learning in nursing and midwifery education. Having used grounded theory methods for data analysis, this chapter presents the findings of the analysis of all the cycles as a product of an iterative process whereby grounded categories were generated from data, and meanings were derived in a negotiated process with the participants (Freeman, 1996). In this study, initial open coding involved the generation of largely descriptive labels for occurrences or phenomena. Such labels gave rise to low-level categories (themes) to establish linkages between such categories and to integrate them into higher-order analytic

categories. The findings from this first cycle were used to develop a pilot plan for effective utilisation of the e-learning platform, and this was put into action in order to develop categories that had been derived.

#### **4.8.2 The sample**

The sample for this phase consisted of 18 nurse educators, 17 nursing students, two ICT managers, three managers who were from three campuses, one representative from Nursing and Midwifery/CMHS-UR, and one representative from the Centre for Teaching, Learning, and Research in Rwanda (experts in distance learning and pedagogy) (Table 4-21). Purposive sampling was used for the participants. In the selection of the campuses the researcher purposively chose campuses that had a good record in using e-learning, and which represented three different provinces out of the five provinces of Rwanda. The following table shows the number of participants who were interviewed and their roles. The following codes for the participants are used throughout the study: **TP** (Teacher-Participant); **SP** (Student Participant) and **FGD-P** (Focus Group Discussion Participant).

**Table 4-21: Sociodemographic profile of qualitative survey participants (n=65)**

<b>Cycle 1: Need analysis</b>			
	<b>FEMALE</b>	<b>MALE</b>	<b>TOTAL</b>
Students	8	9	17
Nurse educators	11	7	18
ICT managers*	0	2	2
FGD (Experts in Distance learning, and Nursing Education)	2	1	3
<b>Total</b>	<b>21</b>	<b>19</b>	<b>40</b>
<b>Cycle 2: Reporting of the preliminary findings and planning action based on the emerging concepts (FGD)</b>			
Expert in e-learning	1	0	1
Expert in nursing education	1	1	2
<b>Total</b>	<b>2</b>	<b>1</b>	<b>3</b>
<b>Cycle 3: Pilot testing of the planned intervention: A training seminar on how to use Moodle as a Learning Management system (Participants).</b>			
Lecturers	10	5	15
<b>Total</b>	<b>10</b>	<b>5</b>	<b>15</b>
<b>Cycle 4: Validation of emerging concepts for the theory</b>			
Expert in nursing education	2	1	3
ICT managers	0	1	1
Expert in e-learning/ distance learning	2	1	3
<b>Total</b>	<b>4</b>	<b>3</b>	<b>7</b>
<b>Grand total</b>	<b>38</b>	<b>27</b>	<b>65</b>
<b>Other categories of data source</b>	<ul style="list-style-type: none"> <li>• Transformation of Higher Education in Rwanda (Law N° 71/2013 of 10/09/2013, Ministry of Education, 2008)</li> <li>• Rwanda Vision 2020 (Republic of Rwanda, 2012)</li> <li>• DRAFT (1st Physical Meeting): WSIS+10: Overall Review of the Implementation of The WSIS Outcomes of the Republic of Rwanda (2015)</li> <li>• Transformation of the Health Sector: Third Health Sector Strategic Plan July 2012 – June 2018 (MOH, 2012)</li> <li>• Transformation of Nursing and Midwifery Education and Practice <ul style="list-style-type: none"> <li>▫ Establishment of National Council of Nurses and Midwives (Official Gazette, 2008)</li> <li>▫ Ministerial order n° 20/22 of 07/03/2011 determining the regulations for registration of nurses and midwives (MINIFOTRA, 2011)</li> <li>▫ Ministerial order determining the code of professional conduct of nurses and midwives (MINIFOTRA, 2011)</li> <li>▫ Introduction of e-learning system in nursing school and midwifery schools (MoH, 2012)</li> <li>▫ Rwanda Human Resource for Health Program. 2011. Rwanda Human Resources for Health Program, 2011-2019: Funding Proposal Part I</li> </ul> </li> <li>• Curriculum used for the advanced diploma in nursing program</li> <li>• Academic rules and regulations for the selected nursing.</li> <li>• Learning Management System used in the selected nursing school (Moodle Platform)</li> </ul>		

\* Because there were few ICT managers, for anonymity and confidentiality of the information provided, they were coded as teachers in the transcripts from the in-depth interview (another reason is that they also teach).

### 4.8.3 Conceptualising the core phenomenon “e-learning”

A core phenomenon is defined as the central idea, event or happening which a set of actions/interactions is directed at managing or handling, or to which the set is related (Strauss and Corbin, 1990). The findings from various sources showed that e-learning as a core phenomenon was understood variously by the participants. This section presents the meaning that emerged from the data (Strauss and Corbin, 1990). Data sources demonstrated that the category of conceptualisation of e-learning, has the following sub-categories as characterising e-learning: (a) A mechanism to advance political agenda, (b) A tool to open access to education for working nurses and midwives, (c) Student-centred approach, (d) Blended learning (face to face and online via Moodle).

#### 4.8.3.1 E-learning as a mechanism to advance political agenda

In this study, data sources indicated that e-learning is conceived as a mechanism to advance the political agenda in the field of education, health and technology in the context of Rwanda. Data indicated that guided by its Vision 2020, Rwanda has made important advances in various sectors of the country – Vision 2020 being a framework for Rwanda’s development, setting out key priorities and providing Rwandans with a guiding tool for their future development. In this study, the focus was more specifically on the aspects of education, ICT, health and population in relation to Vision 2020. On education, the country has made tremendous steps towards ensuring universal education for all, and this is also one of the most important Millennium Goals (MDGs) which was replaced by the Sustainable Development Goals (SDGs) in September 2015 which will carry on the momentum generated by the MDGs and fit into a global development framework beyond 2015. In Vision 2020, a major emphasis is placed on vocational and technical training in the fields of technology, engineering and management. There is also a focus on secondary and tertiary levels, on promoting efficiency, continuous upgrading of skills, and large-scale employment creation programs, and on on-job training, in-service training and distance learning. The extract below reflects this:

*“Rwanda has made tremendous steps towards ensuring “Universal Education for All... Major emphasis will continue to be placed on vocational and technical training in the fields of technology, engineering and management...To promote efficiency and continuous upgrading of skills, large-scale employment creation programs will be launched in the national institutions aimed at on-job-training, in-service training and distance learning.” (Republic of Rwanda, 2012b: 10)*

In relation to science, information, communication and technology, the country is investing in developing adequate, highly skilled scientists and technicians to satisfy the needs of the transition to a knowledge-based economy. Having laid the foundations for ICT take-off in the country through laying of the fibre optic cable network, Rwandans have a whole new world of opportunities to take advantage of, as stated in Rwanda Vision 2020. Furthermore, there is a focus on a proper link between education policies, sector development, labour policies and technology. The extract below shows this:

*“There is a significant increase in the use of computers in the public as well as private sectors. The culture of using computers is higher than ever before. In order to meet the changing demands of the economy, Rwanda has focused on improving its human resource capacity. This includes the development of ICT skills in the civil society, public and private sectors. ICT Capacity Building in the Public and Private Sector is aimed at encouraging the public and private sector to start using ICTs in their transactions.”* (Republic of Rwanda, 2015a: 16)

*“One crucial element to the achievement of Vision 2020 will be to ensure a proper link between education policies and sector development and labour policies.”* (Republic of Rwanda, 2012b: 11)

Rwanda Vision 2020 indicates that the country will continue to rely on imported technology from advanced countries, and well-trained, specialised nationals will be essential to the running and maintenance of technological systems ranging from medicine and agriculture to industry and telecommunications. It is in line with this that the Government of Rwanda has promoted partnership and collaboration with various stakeholders and in particular, US faculty, in order to introduce e-learning in nursing education. It emerged from this study that the partnership with US faculty in the field of nursing education is pivotal to e-learning, by providing technological support, pedagogical support, financial support and research. The extract below reflects this:

*“the country will continue to rely on imported technology from advanced countries, well-trained specialised nationals will be essential to the running and maintenance of technological systems.”* (Republic of Rwanda, 2012b: 11)

In health, the data indicated a focus on addressing the shortage of specialised health personnel and improving the quality of healthcare and health policy, while continuing the successes of home-grown solutions like the community health workers model. The Rwanda Ministry of Health is one of the aggressive users of technology, and has initiated the transformation of the

nursing and midwifery education through its 2012–2018 strategic plan, by upgrading nurses with A2 level (diploma) to nurses with A1 level. This is done through e-learning in nursing education. The extract below demonstrates this:

*“Addressing the shortage of specialised health personnel and improving the quality of healthcare will be the focus of health policy while continuing the successes of homegrown solutions like the community health workers model.”* (Republic of Rwanda, 2012b: 12)

Advancing the political agenda through e-learning is line with the Law N°27/2013 of 24/05/2013 establishing the Higher Education Council (HEC). The primary objective of the HEC is to enhance the quality of education and make sure that those graduating from higher institutions are knowledgeable for the betterment of Rwandan residents’ welfare and development of Rwanda. The extract below demonstrates this:

*“...to design programmes and provide higher learning education so as to award undergraduate, graduate or post-graduate degrees and diplomas in various fields...to provide the student with knowledge, skills, technology and education for self-confidence and self-employment.”* (Republic of Rwanda, 2013a: 19)

#### 4.8.3.2 E-learning as a tool to open access to education for working nurses and midwives

Data sources showed that e-learning is conceptualised as a tool to open access to education for working nurses and midwives. It emerged from the participants and document analysis that the project of introducing e-learning in nursing schools was initiated by the Ministry of Health in partnership with various stakeholders, with the main purpose being to upgrade level A2 Nurses (Diploma) to A1 level (Advanced Diploma). The introduction of e-learning in the schools was based on national needs and had the following objectives: to improve nurses’ and midwives’ knowledge and skills using the modern methods of teaching and learning, to equip different health settings with well trained, qualified nurses and midwives, to contribute to the reduction of infant and maternal mortality rate by referring to Millennium Development Goals four and five, to have about 5000 upgraded and qualified nurses and midwives by the year 2020 through e-learning in nursing education (Rwanda HRH, 2011).

Data sources indicated that nurses are a significant component of the health workforce; however, there is a need to increase the number of healthcare professionals by training more qualified nurses. Data from document analysis showed that nurses with A2 level were predominant, and this had to change in order to meet regional and international standards

(Rwanda HRH, 2011). Data sources indicated that e-learning was used in nursing education in order to urgently increase the supply of health workers, since traditional classroom training in specific institutions has proven to be insufficient to accommodate all those who have previously been trained and currently hold a diploma in nursing. The Ministry of Health and its partners have initiated an innovative e-learning course on several aspects of health workers' training which would not only address the critical shortage of qualified nurses in Rwanda, but would also result in improved health services, particularly in remote areas.

In this study, it surfaced that the government of Rwanda decided to phase out A2 level (diplomas), and to upgrade them to A1 (advanced diploma). Under the initiative of the Ministry of Health and other state holders such as APEFE, AREA SANTE, and Belgium Technical Cooperation (BTC) in order to get rid of the content-based curriculum, a competency-based curriculum was developed in five nursing schools in order to upgrade the level of Nurses and Midwives (Byumba, Kabgayi, Kibungo Rwamagana, and Nyagatare). The aim of upgrading the level of nurses is to train competent nurses and midwives who can respond to the need of the Rwandan population in any health setting, to promote self-directed learning, long life learners and critical thinkers.

It emerged from the findings of this study that due to the level of competency established by the previous curriculum, only a small number of A1 graduates were being produced to fill the gap, and it would take many years to upgrade the A2 level nurses who are the majority in all three of the currently existing nursing and midwifery categories, as highlighted above. There was thus a need for training to upgrade A2 level to A1 level on a large scale, using an e-learning platform that would enable A2 level nurses to upgrade their level without leaving their job. It emerged that the project to introduce e-learning in nursing schools was initiated by the Ministry of Health in partnership with various stakeholders such as Rwanda HRH (Human Resource for Health), with the main purpose being to upgrade the level A2 Nurses (Diploma) to A1 level (Advanced Diploma). It emerged that e-learning could make it possible to upgrade a large number of A2 nurses without leaving a gap in their working environment, thus creating time for face-to-face and online interaction with the teachers. The extracts below from participants' comments shows this:

*“The concept of introducing e-learning in our institution it was for upgrading A2 nurse, upgrading more A2 nurses in a short time...then...e-learning is for facilitating to upgrade more A2 nurses to A1 in a short time...” (TP19)*

*“The e-learning program in five schools of Nursing and Midwifery is a special program which was developed to upgrade the A2 from the hospitals and Health Centres to A1 level. The main objective is to upgrade the level of those nurses while they are still working in their respective places of work...”*  
**(TP20)**

Data sources indicated that e-learning creates a new environment for teaching and learning where rich content can be deployed easily, quickly and cheaply. It allows virtual communication among teachers and learners through e-mail, discussion forums, chats, audio/videoconference and instant messaging. The internet makes almost infinite worldwide resources available to learners, and e-learning allows for flexibility of time and distance for teachers and learners. The digitalisation of its processes allows rapid growth of any course cheaply, with much greater control of student activity at an individual level, and automating several levels of administration and tutorial activity. It surfaced from the data collected from the participants that e-learning is a flexible tool for widening access to nursing and midwifery education, irrespective of age, and location. Data sources indicated that e-learning was introduced as a way of giving nurses a chance to upgrade their level of education without leaving their job and, in the process, phasing out A2 (nurses with diploma level) in favour of A1 (nurses with advanced diploma). E-learning platforms came as support for the initiative that had already started to phase out A2 level nursing schools and keep five nursing schools. Nurses continue to work while studying, which enables them to study, work and care for their families. The participant comments below reflect this:

*“e-learning is a good program because it helps many people in peripheral hospitals, health centres where learning was on lower level...it helps us because we increase our level of the study...”* **(SP13)**

*“I like to be e-learner...because I found the benefits of e-learning program...I manage my family...and also I increase my knowledge...by using these ICT technologies...Students are interested in using them instead of being in the school for a long time...someone can be a student and a worker at the same time ...”* **(SP11)**

*“...because sometimes we come here and we study...when we return in our institution ... we continue to follow our course with the teacher or even with our colleagues online...if we are in our hospitals, we can know the information from school...can receive lessons...the teacher can send notes or can even create a discussion ...we can discuss with colleagues...you can even ask if there is where you do not understand... the lecturer can answer...”*  
**(SP5)**

It emerged from this study that e-learning is linked to the use of ICT in teaching and learning, and helps to provide access to education for working nurses and midwives. Use of ICT is a cornerstone of e-learning, because it increases collaboration between educators and students and supports innovative pedagogy. It was also found that ICT allows students to work in teams and share ideas related to the curriculum, and students learn new skills. The use of ICT tools such as Moodle in e-learning encourages independent and active learning, assists in information retrieval, increases motivation to learn, self-confidence and self-esteem. The comments below reflect this:

*“we use the Moodle when we are at work...our lecturer can give to us the instructions...he can also give the quiz...our lecturer put in the system how we are going to answer her...we answer...and we post it in the system and later we get the feedback...” (SP1)*

*“nowadays we use the computers...we can save our documents...maybe on our e-mails, later we can find our documents easily and we can keep it for a long time...and even you can use it to search many things...to make research nowadays it is easy ...” (SP12)*

*“mostly we use computers while preparing the course guidelines, the power points for presentations, and other materials... We use also the Internet where sometimes we download some books to read, some journals to give to the students...we use also the Internet for exchanging information...” (TP18)*

In this study, participants expressed that e-learning provides opportunities to use technology to get information remotely without being restricted by time (e.g. working hours of the library) or by distance (e.g. travelling to the library). E-learning provides options to search solely open-access resources. In emerging data from this study, participants reported that e-learning provides the opportunity to access a wider range of resources, anytime and anywhere. Student participants said furthermore that they can access the courses easily while they are in their respective workplaces, and do some assessments and quizzes without necessary being at school. However, participants also reported that there should be motivation and proper use of the internet in order to access these resources. The comments presented below reflect this:

*“we access the course easily when we are at our workplace, we access the quizzes, the assignments...we can also chat with other students...we can chat with the lecturer to give us the explanation...it helps us to know new things in our study...” (SP12)*

*“E-learning is good in education because you have to search information from different resources...” (TP3)*

*“in e-learning program, the student may improve her/his knowledge through those online resources... they can motivate the lecturers, because when you motivate someone, so they work even during the night, and during the day without getting the problem...” (TP7)*

*“Yeah it reduces the time the students will be at school, by using the video teleconference...” (TP13)*

#### 4.8.3.3 E-learning as a student-centred approach

E-learning was conceptualised in this study as a student-centred approach. The findings from various sources indicated the following dimensions as characterising a student-centred approach in e-learning: (a) it promotes self-directed learning; (b) it is collaborative; (c) it is inquiry-based learning; (d) it is interactive learning; (e) it promotes the integration of theory and practice.

**E-learning promotes self-directed learning:** Data sources indicated the importance of e-learning in implementing teaching practices that aim to promote and foster the skills associated with becoming autonomous, self-directed learners. Self-directed learning skills can be developed and promoted in such environments through careful design of interactive tools that extract the artefacts of existing practice to encourage self-management, self-monitoring and motivation.

The participants from this study indicated that e-learning promotes self-directed learning. And based on the responses from the participants, self-directed learning accounts for 60 per cent of the time in an academic year. It was indicated that in self-directed learning students learn on their own information, from lecturers or other resources. Participants reported that they manage their learning activities wherever they are, even at work or at home. It was noted that participants took initiatives, were responsible for their learning, were comfortable with independence, self-discipline, self-confident, and had a high degree of curiosity. The participants said that they appreciated self-directed learning because they get more than what their facilitators should provide; it allows them to do other activities, and the teachers mentor, and give them constructive answers when they meet difficulties while learning on their own. Another element that emerged was that participants viewed problems as challenges, and not obstacles, which they had to solve using their basic skills and experiences. It was noted as well that participants reported that self-directed learning allows participants to learn at their own pace, setting their own goals. Some of the participants explained how they enjoyed learning in self-directed learning as it helped them evaluate the achievement of their goals. Teachers

shared the same view that e-learning can help them in self-directed learning in their free time, such as during the evening, and particularly when they are preparing their lessons as they have open access to information. Some comments from the interviews were:

*“we can make the research from different websites ...you can remind yourself what you have studied” (SP15)*

*“When e-learning is used properly, it is exciting, it makes the student be self-directed...It lets the staff, the nurses learning in their hospitals while giving nursing care and the same time learning.” (TP4)*

*“...currently the self-directed learning is very much important...Students are given enough time to go and learn on their own, using technology...online they can find many resources, eBooks, and different journal articles...students can download and read them.” (TP17)*

**E-learning promotes collaboration:** Data reflected that a student-centred approach promoted collaboration among the nursing students and their teachers. Data sources demonstrated that collaborative learning can occur in larger groups or peer-to-peer. Peer instructions or peer learning promotes the involvement of the students, either in pairs or small groups in activities that encourage discussions, and problem-solving. Similarly, in e-learning this can be done through forum discussion, chatting, and communication with peers or teachers through emails or social networks.

Another point emerging from the data was that in e-learning, collaboration was a key point between teachers, students, ICT managers, administrative staff and the various stakeholders. This was because collaboration promotes working together (teamwork) and cooperation among students, and allows students to contribute and encourage each other. Data indicated that to achieve collaboration students need to have shared responsibilities and visions in solving problems, as they give and accept feedbacks from their peers and teachers. Student participants also indicated that collaborating with their peers was very helpful in terms of getting more clarification on various topics they might not have understood. The findings showed that the participants used the forum group on LMS (Moodle), chatting, emails, group emails, Facebook, WhatsApp even during face-to-face interactions with their teachers or during group discussions with their peers. The collaboration in e-learning mentioned by the participants, indicates the active involvement of teachers, students and peers in an academically constructive way. Some comments from the interviews were:

*“even on the emails I can chat with them [students], even on WhatsApp. I use even these, because if I say I will use only Moodle it is very difficult ...and I*

*ask them if you have any problem, call me on the phone, or send me an email or an SMS on WhatsApp...I am ready to respond to any question.” (TP1)*

*“we use the group work because if I will fail to find the answers, others can explain...or can assist.” (SP3)*

*“even we create a discussion ...we can discuss with colleagues via email group, Facebook, and WhatsApp.” (SP5)*

*“When we are facilitating the students we try to upload the content, the course syllabus, the notes, the quizzes... and so on. We create chat forum...with the students...we revise how they participate. And I try ...to ask some questions and giving feedbacks.” (TP18)*

**E-learning promoted inquiry-based learning:** Data showed that e-learning serves as a tool to enhance inquiry-based learning. Inquiry-based learning is learning by doing, developing reflective practice, and is problem-based or project-based. It was also interpreted as a form of discovery, allowing the students to reflect, observe and explore, plan and predict and thereafter experiment and reflect. The findings from the participants in this study indicated that e-learning helps in collecting critically analysing information from various sources, and then taking decisions. It was found that this was done through research on Internet. This is because it was found by the participants that e-learning provided more up-to-date information than the old books which can be found in the library. The inquiry-based learning was also reported as taking place through the questions asked in the forum discussion or online discussions, or through assignments (individual and group assignments) where learners have to have to find information from a number of sources in order to respond to the given task. The findings from the Moodle platform indicated that either teachers or students could initiate discussion, and most of the time teachers used open-ended questions. Some comments from the interviews were:

*“it helps students in terms of research, when they are comparing different information, they try to analyse, criticise and take decisions.” (TP3)*

*“if you use the Internet, you search and you receive more information...but if you use the books it is very difficult to receive more information, or new information, or up to date information.” (SP7)*

*“we just use the forum...the chat...where students may give information or may ask questions... you don't provide an answer as a lecturer...you let other students answer, they challenge their colleagues...by the end, you try to analyse if these students are really together...are really working.” (TP6)*

*“we do research...they give us some works, some exercises to do on Moodle, and we can reply to them.” (SP16)*

**E-learning promotes interactive learning:** Data sources revealed that e-learning promotes purposeful exchange and challenge of ideas through the involvement of peers and/or teachers, and all students have equal right to contribute. It emerged from the data that e-learning promotes interactive learning as a way of engaging the students, and keeps them motivated for a better understanding of the lesson. The participants reported that to make the lesson more interactive they use videos, pictures, animated PowerPoint, forum discussion, chatting and including web links which may attract the attention of the students. Furthermore, participants said that they engage more through participative group discussion, brainstorming, small group discussion and case scenarios. Some teacher participants said they also use social media and teams to make e-learning more interactive. One of the comments from the interviews was:

*“I use...group discussion, and very animated power point that are attractive to them, but this goes with lecturing, role plays, for example I can present something, and take students to do some role plays... I use also brainstorming methods in teaching... for the students to participate in the course, for example to have the group discussion, because when students discuss on something...they understand very well... when they are in small groups, and discuss it.” (TP7)*

**Active engagement:** Data sources indicated that active engagement of adult students in their own learning is essential to assist the students to build their own knowledge. Through e-learning, students actively participate in the learning process in partnership with teachers and other students. Students’ contributions and challenges are respected by other students and the teacher. The active involvement is achieved through face-to-face and online interactions. In online participation, the students interact with teachers and peers either synchronously or asynchronously. In synchronous participation, students engage in real time. This is done through video conferencing, and instant messaging/live chat, and this allows collaboration between the students and the teacher in the real time. Data sources indicated that in asynchronous participation the information is shared among a network of people, outside of real time and place. In asynchronous participation communication is done through the use of emails, forum discussions, blogs, and Moodle as the learning management system will facilitate discussions, posting and replying to messages, and uploading and accessing courses and multimedia. Comments below show this:

*“I use group discussion, and very animated power point that are attractive to them, but this goes with lecturing, role plays, for example I can present something, and take students to do some role plays.” (TP17)*

*“when we are in the group we do the discussion, ...and the problem or the issues in the course are resolved...and help us to memorise very well our courses.” (SP4)*

*“teachers use Moodle... they post some outline courses, they put assignments, the forum discussion.” (TP4)*

*“I use my computer for learning or having some discussions, receiving some information on e-mails...Moodle platform.” (SP11)*

**E-learning promotes the integration of theory and practice:** Data sources indicated that e-learning allows the students to become agents of change by using evidence-based practices. Properties emerging from this dimension indicated that the integration of theory and practice allows students provide care that is patient-centred, while being critical thinkers, being creative and making a link between what they studied in the theory and clinical practice. With the introduction of e-learning in nursing schools in Rwanda, the emerging data reveals that students attending these programs are assisted by them to correct some malpractices. Participants further stated that it is a kind of integration, because they put into action or practice what they have learned at school during face period. It also emerged that because these enrolling in e-learning program have been working in various settings, they bring the experience they have accumulated throughout the year into the classrooms, which makes the course more interesting. Data could be interpreted as indicating that evidence-based practice promotes collaborative learning and enhances active engagement of the students. This is because integration of theory and practice is based on real problems, and students can auto-evaluate themselves in their achievement of their learning goals. Some comments from the interviews were:

*“I think it is a good program in the context of Rwanda... students leave the campus during face to face sessions...going back to their clinical settings. It is a kind of integration...the students may just come from the school and start integrating...the new acquisition to the health centres and to the hospitals...And it is also good because sometimes lecturers maybe talking things but don't link them with what is on the ground...then the students are having the experience from the ground.” (TP6)*

*“the interest in e-learning program is to participate...when you are at work... when you learn something you put it in action [...] we do the correct practice because we learn and we work.” (SP1)*

#### 4.8.3.4 E-learning as blended learning

Data emerging from this study indicated that e-learning was perceived as blended learning. Emerging dimensions of how e-learning is blended learning are the online teaching and learning and the face-to-face teaching and learning.

Data sources indicated that e-learning is a form of learning that combines online and face-to-face learning. It was noted that e-learning was seen as a tool that uses ICT in teaching and learning, allowing access to resources at anytime and anywhere; thus e-learning was cost-effective and time-saving. Data emerging from this study indicated that blended learning allows the participants to be more engaged, whether face to face or via web-based LMS (Moodle in the context of Rwanda). It emerged that face-to-face learning accounts for 40 per cent and self-directed learning accounts for 60 per cent of the teaching period. Participants reported that this form of blended learning is flexible because it gives students the chance to search for information, and when they come back to school they can engage more with the teachers on particular points where they hadn't understood. It was also noted that teachers particularly use interactive and innovating teaching methods in classroom sessions such as videos, participatory teaching, and small group discussions. For the part that is done online, a number of resources are made available to students, and they may become proactive in their learning through forum discussion, chatting, doing quizzes and assignments. It was also noted that blended learning gives participants an opportunity to become more familiar with the technology, whether synchronously or asynchronously.

**Online teaching and learning:** The findings from this study indicated that in e-learning there were benchmarks for online teaching and learning, and that in e-learning there is an emphasis on student interaction with faculty and other students, which is an essential characteristic and is facilitated through a variety of ways, including voice-mail and/or e-mail. Feedback on student assignments and questions is constructive and is provided in a timely manner. Students are instructed in the proper methods of effective research, including assessment of the validity of resources. For online teaching and learning to be effective, course development benchmarks should be considered. This includes the use of guidelines regarding minimum standards for course development, design and delivery, and determining the technology being used to deliver course content. Instructional materials are reviewed periodically to ensure they meet program standards. In this study, participants expressed that teachers who had had the benefit of some training had enough competence to be able to facilitate the students via the e-learning platform.

It emerged also that those who are more knowledgeable in using the Moodle platform facilitate those who have not mastered the particular use of Moodle and a learning management system. The comments below show how some of the teachers facilitate the students:

*“The facilitation is during the forum discussion; it is where the teacher should facilitate the learner very well because when I post for example the part of the course which was not studied face to face...they should discussion or ask questions.” (TP4)*

*“...for us we use Moodle platform, we use it to communicate to them, every student has an access to Moodle platform...when the teacher wants maybe to discuss on some issues in the course, then the lecturer informs the students via Moodle platform.” (TP7)*

*“...the types of activities I do when I am interacting with them online...the first is to use a forum, where I can request them to discuss and to evaluate how the face to face happened, and ask me if they have questions...I could respond to them. The second one is to provide some assignments, or quizzes online.” (TP19)*

**Face to face teaching and learning:** It emerged from the data that e-learning and its blended mode combines face-to-face teaching and learning sessions because it allows nursing students to maintain a connection to the campus and their peers and promotes a stronger student–instructor connection. Though the face-to-face part of e-learning, nursing students and teachers create a social interaction through group collaboration to facilitate high achievement and promote verbal and nonverbal communication. The findings from this study indicated that in face-to-face teaching the part to be taught, depended on the suitability of the subject area, course difficulty level, course importance and interest, availability of resources, and level of engagement of the students. It emerged that students work in groups, and the teacher facilitates the teaching process through the use of active teaching methods which put the students at the centre of their learning, while providing immediate feedback visually and verbally. The teaching sessions are done in real time and there are specific timeframes for discussions. Numbers of methods have been reported, such as brainstorming, group work, group assignments, student presentations, videos and demonstration, lecturing and giving test and exams while they are at school. It is during also in face-to-face interactions that students get the opportunity to integrate theory and practice – for example during procedures demonstration and counter demonstration in the skills laboratory at school and during clinical practices in different clinical settings, and the final exam was done during face-to-face sessions. Data indicated that students spend 40% of total hours of the academic year in face-to-face learning,

and during that period the students have to come to school for two weeks. The comments presented below reflect this:

*“I choose which part of my course that will be face to face...basing on the how difficult the part is, so with that one I look at face to face... so that the questions can be asked face to face. When it is practical I prefer to use face to face...so for each chapter I take one part to be face to face, then another part to be online.” (TP4)*

*“...sometimes I use lecturing, group discussion, and very animated power point that are attractive to them, but this goes with lecturing, role plays, for example, I can present something, and take students to do some role plays.” (TP17)*

*“In e-learning system...students’ exams, their assignments, their continuous assessment test are done face to face and they have to be followed in their clinical practices, also face to face.” (TP2)*

*“when we are having a practical course...there is one coordinator but there may be more than one lecturer ...so during the time of demonstration...they try to make small groups so that students may work in small groups.” (TP6)*

#### **4.8.4 Antecedent/causal conditions**

To recap, antecedents or casual conditions are those events or incidents that lead to the occurrence or development of a phenomenon (Strauss & Corbin, 1990), which in the context of this study is the utilisation of an e-learning platform in undergraduate nursing schools.

Five main categories emerged from this study as antecedents were (a) Reforms in nursing education; (b) Inadequately prepared graduates; (c) Insufficient number of graduates; (d) Need to upgrade larger numbers of graduates from the level of A2 nurses to A1; (e) The nature of the graduate produced after engaging in the new curriculum.

##### **4.8.4.1 Reforms in nursing education**

Data indicated that the changes proposed by healthcare reform have the potential to significantly alter the environment in which nurses and other healthcare professionals will practice. The role of nursing education is pivotal in realising a transformed healthcare system. Data demonstrated that the training of nurses and midwives in Rwanda can be traced back in the colonial era. Although several reforms have been made in nursing and midwifery education, nurses still had a low level of education, with A2 level qualification acquired through training at secondary school level. It emerged from the data that the curriculum used was content-based,

which left them poorly prepared to meet the needs of the population. It emerged from the findings also that the majority of the nursing workforce is made up of A2 nurses who are widespread across the country. Among the reforms indicated in the data sources has been a recent emphasis on training nurses at an advanced level by upgrading all A2 nurses to A1 level in order to improve the quality of nursing education. The reforms also reduced the number of schools that were training A1 nursing students to five: Byumba, Kabgayi, Kibungo, Nyagatare and Rwamagana. This was done in an effort to improve the quality of nursing education and standardise graduation requirements. The Government of Rwanda approved a new nursing curriculum to include core competencies and specific benchmarks for graduation (Rwanda HRH, 2011). The passage below reflects this:

*“Nursing and midwifery education in Rwanda has been dramatically reformed in recent years. In the past, all nurses were trained at the A2 level, meaning they had a secondary school diploma. Many types of schools prepared young people to serve as nurses, including faith-based, private, and government schools. Unlike nursing education in surrounding countries, there was no educational ladder to professional nursing. In 2007, the government of Rwanda discontinued A2 nursing education and issued a requirement that all nurses working in Rwanda be educated to at least the A1 level (A2 plus 3 years of higher education).”* (Rwanda HRH, 2011: 151).

#### 4.8.4.2 Inadequately prepared graduates

Data sources indicated that nurses are the main professional component of the front-line staff in most health systems, and their contribution is recognised as essential to meeting development goals and delivering safe and effective care. It is essential to produce nurses prepared to practice in reformed healthcare environments; institutions can no longer educate nursing students using the traditional educational practices that have long been embraced. Nursing education has a major role to play in the development of graduates who can deliver high quality of nursing care, and do so in a manner that harmonises theory and practice.

Data from this study indicated that historically, there were three levels of training for nurses and midwives in Rwanda, A2, A1, and A0. A2 level nurses and midwives are trained at secondary school level while A1 nurses and midwives have an advanced certificate following three years of tertiary education. A0 nurses and midwives have a bachelor’s degree. The MoH decided in 2006 that training and deploying A2 level nurses and midwives should stop as their skills were deemed insufficient to provide quality patient care. The minimum requirement for a Rwandan nurse is thus now A1 (Rwanda Ministry of Health and Rwanda HRH, 2011: 12-

13). Data showed that nursing students should be adequately prepared for their future professional role in order to fit into the nursing workforce. However, the gap between theory and practice continues to be a prevailing problem in nursing and midwifery, and the newly graduated nurses often confront an array of physical, technical, and mental challenges in bridging the academic and clinical divide. Bridging the gap between theory and practice has implications for recruitment of students into the nursing program, as well as for retention of newly educated nurses. Reflectively, it is time for the nursing community and the teaching institutions to utilise innovative strategies to expand and meet human resources in health requirements. A unified approach must be pursued to address existing challenges.

### **Insufficient number of graduates**

Data sources indicated that considerable attention has been focused on the apparent shortage of health workers and the potential impact of the shortage on the country's ability to fight diseases and provide essential life-saving interventions. Not only are current numbers insufficient to meet health needs, but the pre-service training is also insufficient to maintain absolute numbers of nursing graduates to fill the gap at different levels of the healthcare system. Data from this study revealed that the level of competency achieved in the previous curriculum produced only a small number of A1 graduates to fill the gap and that it would take many years to upgrade the A2 level nurses who are the majority in all three nursing and midwifery categories currently existing in Rwanda (A2, A1, and A0). There was then a need to train to upgrade A2 level with A1 level on a large scale using an e-learning platform through which A2 level nurses would upgrade their level without leaving their Job (Rwanda Ministry of Health and Rwanda HRH, 2011).

Up to 2012, more than 90% of the nurses have the lowest level of nursing training available (equivalent to secondary-school qualifications, or A2 level); A1 nurses represent less than 10% of the total pool of nurses. A2 nurses are relatively evenly spread throughout the country, though there are still disparities between districts, with a number of under-served districts in the South, West and Northern Provinces. On average there is about 1 nurse for a population of 1,500 (Rwanda Ministry of Health and Rwanda HRH, 2011: 12-13). Table 4-22 indicates the types of nurse qualification and the place of work. The extract below shows the magnitude of insufficient qualified staff:

*“Many health facilities continue to use a large number of A2 nurses due to the lack of A1 nurses. It is however believed that this negative trend will change in a few years’ time as most nurses and midwives are currently being*

*educated in a three-year program at schools of nursing and midwifery throughout the country.” (Leuchowius, 2014: 34)*

**Table 4-22: Nurses’ qualification per workplace from DHSST (2009) cited in (Rwanda Ministry of Health (MOH) and Human Resource for Health (HRH), 2011: 13).**

Nurses per qualification	Health centres	District Hospitals	District Pharmacy	Grand total
<b>AO</b>	2	18	0	20
<b>A1</b>	186	271	0	457
<b>A2</b>	3935	2175	42	6152
<b>Grand total</b>	4123	2464	42	6623

#### 4.8.4.3 Need to upgrade larger numbers of graduates from the level of A2 nurses to A1

Data sources indicated that government in Rwanda decided to phase out A2 level nurses, and upgrade them to A1. Under the initiative of the Ministry of Health and other stakeholders, to get rid of the content-based curriculum, a competency-based curriculum was developed in five nursing schools (Byumba, Kabgayi, Kibungo Rwamagana, and Nyagatare) to upgrade the level of nurses and midwives. The aim in the upgrading is to train competent nurses and midwives who can respond to the needs of the Rwandan population in any health setting and promote self-directed learning, life-long learners and critical thinkers. The extract presented below reflects this:

*“The Rwandan government identified that there was a shortage of skilled workers and the traditional methods were not preparing the learners to attain skills which would allow them to become responsible nurses who would provide optimum nursing care in the country at all health sectors and in the region.” (MINISANTE, 2007)*

#### 4.8.4.4 The nature of the graduate produced after engaging in the new curriculum

Data sources indicated that although boosting pre-service training is clearly important it is a longer-term solution. Hence, various complementary, shorter-term responses must also be considered, and it is important not to ignore the more expensive, longer-term issue of pre-service training. The introduction of competence-based learning in nursing in 2007 had a positive impact on quality of the graduates produced. The e-learning system that was introduced in 2012 in nursing schools, and later the modular system, strengthened government resolve to produce a large number of competent nurses and midwives. The changes that took place promoted the use of active teaching methodologies and active involvement of students in order to produce competent graduates who are able to face the daily health challenges in the context of Rwanda. During the celebration of nurses’ day in 2015, the Registrar of the National

Council for Nurses and Midwives commended nurses for the great role which they play. The reduction in mortality rates, and particularly in neonatal mortality, might be an indication of the improvement in the health sector brought about by competent graduates.

Analysis of the curriculum documents presently in use (graduate competencies, level outcomes, programs outcomes, conceptual framework, program vision philosophy sections, the way the content are delivered to allow students not only to have theory, but also select-directed learning and clinical practice), gives a clear indication of the kind of graduates that should be produced on completion of their courses. On completion of their program, nurses and midwives have to write a licensing examination organised by NCNM which allows them to work anywhere in the country and outside the country. The statement below highlights the need for a competency-based curriculum which uses a range of teaching strategies including e-learning.

*“They also have to give the best and cost-effective care in order to support health schemes in the country such as Mutuelle de Santé.” Julie Kimonyo, the registrar at the National Council of Nurses and Midwives (NCNM).”*  
(New Times, 2015)

At an International Nurses’ Day celebration in May 2015, Prof. Phil Cotton, the Principal of University of Rwanda’s College of Medicine and Health Sciences, drew attention to the high expectation laid on graduates to change the hospital image and make it a better place for the patients

*“You should change the bad reputation of hospitals that they are a dangerous place to be for patients.”* Prof. Phil Cotton told the nurses. (New Times, 2015)

#### **4.8.5 Context**

According to Strauss and Corbin (1990), context refers to a particular set of conditions within which the researcher constructs action and interactional strategies to manage, handle, carry-out a phenomenon of interest. In this study, the set of conditions included legal frameworks that give power to those who want to implement ICT programme: (a) Rwanda Vision 2020, (b) The transformation of higher education in Rwanda, (c) The transformation of nursing and midwifery education, (d) Partnership with other higher teaching and learning institutions (USA Universities through HRH program) to upgrade nursing and midwifery education. (e) National Strategic Plan ICT.

#### 4.8.5.1 Rwanda Vision 2020

Rwanda Vision 2020 is one of the legal frameworks that is used as the basis of e-learning utilisation in nursing education. Vision 2020, as revised in 2012, is a framework for Rwanda's development, presenting the key priorities and providing Rwandans with a guiding tool for the future. It supports a clear Rwandan identity, whilst showing ambition and imagination in overcoming poverty and division. The Rwandan government, together with its partners, donors, civil society organisations and the private sector, is now in the process of formulating more detailed sectoral plans for attaining the goals of Vision 2020. Vision 2020 has six priority pillars and three cross-cutting areas. In this study, the interest was in education; science, technology and ICT; health; and population.

**(i) Education:** In this study, document analysis indicates that in Education, Rwanda Vision 2020, the country has made tremendous steps towards ensuring universal education for all, one of the most important Millennium Goals, and another key point relating this study is that there is major emphasis is placed on vocational and technical training in the fields of technology, engineering and management. This will be targeted at secondary and tertiary levels. To promote efficiency and continuous upgrading of skills, large-scale employment creation programs will be launched in national institutions, aimed at on-job-training, in-service training and distance learning. The data from the Rwandan Vision 2020 was that although the country will continue to rely on imported technology from advanced countries, well-trained specialised nationals will be essential to the running and maintenance of technological systems, ranging from medicine and agriculture to industry and telecommunications. The passage presented below reflects this:

*“Major emphasis will continue to be placed on vocational and technical training in the fields of technology...This will be targeted at secondary and tertiary levels...to promote efficiency and continuous upgrading of skills, large-scale employment creation programs will be launched in the national institutions aimed at on-job-training, in-service training and distance learning...well-trained specialised nationals will be essential to the running and maintenance of technological systems.” (Republic of Rwanda, 2012c: 10-11)*

**(ii) Science, technology and ICT:** In this study, document analysis indicates that in science, technology and ICT the country is investing in developing adequate, highly skilled scientists and technicians to satisfy the needs of the transition to a knowledge-based economy. Having laid the foundations for ICT to take off in the country through laying of the fibre optic cable network, Rwandans have a whole new world of opportunities to take advantage of. Another

aspect related to science, technology and ICT is a linkage between education policies and sector development and labour policies. The passage presented below reflects this:

*“Rwanda will continue to invest in developing adequate, highly skilled scientists and technicians to satisfy the needs of the transition to a knowledge-based economy. A knowledge based-economy will require innovative products that can be competitive in regional and global markets...More importantly, the government of Rwanda will encourage the use of ICT as a tool for self-employment, innovation and job creation...ICT as a tool for improving service delivery in both the private and public sector will be emphasised.”* (Republic of Rwanda, 2012c:17-18)

From the analysis of various documents, it was found that the government of Rwanda recognises the digital divide in ICT and access to the internet, and is trying to bridge the divide. In this area, the findings reveal that Rwanda has made an enormous progress in the areas of ICT guided by its Vision 2020. In the framework of implementing Rwanda’s Vision 2020 that focuses on transforming Rwanda to a knowledge economy, the government in Rwanda initiated the National Fibre Backbone project in 2008 with the aim of providing connectivity and adequate broadband communications services across the country. Data indicate a number of government projects, such as E-Rwanda, in which the objective is to achieve the project target through the use of ICT. Government is encouraging traditional media to bridge the knowledge divide and to facilitate the flow of cultural content, particularly in rural areas. In another development, Microsoft recently unveiled Windows 8 in Kinyarwanda. Extracts from documents analysis show how the country of Rwanda has made a lot of progress in regard to ICT: The passages presented below reflect this:

*“E-Rwanda...is a project funded by World Bank that aims to help the government of Rwanda achieve its policies of developing the country through ICT. The project supports components which focus on the use of technology as an enabler to growth and development in all sectors.”* (Republic of Rwanda, 2015a: 36)

- (i) Health and the Population: Data emerging from various sources indicate that Rwanda continues to have high population density, but with the success of current and future population policies, the projection is that Rwanda will reduce the fertility rate within the remaining nine years from 4.6 children (2010) to three by 2020, and reduce population growth from about 3% (in 2000) to 2.2% (in 2020). It also emerged that Rwanda has made great progress with regard to the state of health of the Rwandan population, such as reduction of HIV/AIDS and endemic diseases, although challenges remain with

malnutrition and the increase of non-communicable diseases. Campaigns to eradicate malnutrition amongst children will be emphasised and also raise awareness of prevention and treatment of non-communicable diseases. The Vision 2020 data also indicated that a focus on addressing the shortage of specialised health personnel and improving the quality of healthcare and health policy while continuing the successes of homegrown solutions like the community health workers model. The passage presented below reflects this:

*“Rwanda remains with one of the highest population densities in Africa...Rwanda considers its population as its fundamental resource and banks on it for its future development...Although tremendous progress has been made with regard to the state of health of the Rwandan population, with an impressive drop in HIV prevalence (from 13% in 2000 to 3% in 2011) and reduction in incidence of endemic diseases (malaria and TB); challenges remain with malnutrition and the increase of non-communicable diseases...Addressing the shortage of specialised health personnel and improving the quality of healthcare will be the focus of health policy while continuing the successes of homegrown solutions.”(Republic of Rwanda, 2012c: 11-12).*

It emerged from document analysis that the health sector in Rwanda has made ICT a priority in delivery of services, from community health workers to the university teaching hospitals. A lot of projects have been initiated by the Ministry of Health and its partners. Government documentation (Republic of Rwanda, 2015a) indicates that e-learning has been established in five centres for e-learning, successfully using videoconferencing, in different provinces with total of 614 students (in nursing and midwifery), with the system being used to upgrade nurses from A2 (Diploma level) to A1 (Advanced Diploma). E-Health in Rwanda is one of the sectors that have enjoyed the benefits of using technology. This is manifested by various activities done in the health sector through E-Health such as the following:

- (i) Rwanda Health Management Information System (R-HMIS): a system that integrates data collection processing, reporting, and use of the information for programmatic decision-making. For example, Monthly reporting forms for Health Centres, District Hospitals, Referral Hospitals and Private health facilities.
- (ii) Data warehouse/Dashboard: is a “One-stop shop”: for key health sector indicators pulled from multiple systems.

- (iii) **Rapid SMS (RAPIDSMS):** System used to save newborns and mothers through routine surveillance of health events by Community Health Workers (CHWs).
- (iv) **mUBUZIMA:** Is an application that builds on Rwanda's mobile phone infrastructure to support Community Health Workers. It allows Community health workers to enter and transmit Community Health Information System (CHIS) indicators in real time even in remote parts of the country using only a mobile phone. The system is also used to facilitate the reporting of MDGs indicators directly from the community (Village) to the Ministry of Health.
- (v) **Electronic Integrated Diseases Surveillance and Response (EIDSR):** is a strategy for coordinating and integrating surveillance activities by focusing on the surveillance, laboratory and response functions of the national disease surveillance system.
- (vi) **OpenMRS:** An open-source Medical Records System that tracks patient-level data.
- (vii) **TracPlus and TRACnet:** Monthly monitoring of infectious diseases including HIV/AIDS, TB, and Malaria.
- (viii) **Telemedicine:** is used to deliver health and healthcare services where patients are treated by experts without moving from their respective district hospitals. The technology has reduced the cost and risk of transport for patients and doctors.
- (ix) **Human Resources (iHRIS):** Is used to improve planning, management and registration of human resources across the health system (Republic of Rwanda, 2015a: 30-31).

#### 4.8.5.2 Transformation of higher education in Rwanda

**Merging all public universities to form University of Rwanda (UR):** Data from documents analysis indicated that many changes took place in the Rwandan tertiary education in 2013 when MPs endorsed a bill that seeks to have some 10 universities in the country merged to form one institution of higher learning. The Bill allows the University to develop high education quality and innovative teaching and research for addressing the problems of the population, the students, the nation, the region and globally. Law N° 71/2013 of 10/09/2013, which is a law establishing the University of Rwanda (UR) and determining its mission, powers, organisation and functioning, came into effect on the day of its publication (Republic of Rwanda, 2013c).

These changes have also affected public nursing and midwifery schools. The provincial nursing and midwifery school programs have recently come under the administrative umbrella of the University of Rwanda, and its College of Medicine and Health Sciences. Nursing education is provided through either a 4-year degree program at the University or a 3-year diploma of the nursing program in each one of 5 provincial schools. As the MOH continues to support upgrading nursing education in Rwanda, a greater number of nurses with A1 and A0 designation will be available to practice and teach as healthcare professionals in the country (Thuss, 2014).

**Establishing Higher Education Council and determining its responsibilities, organisation and functioning:** According to Law N° 72/03 of 10/09/2013 establishing the Higher Education Council (HEC), the primary objective of the HEC shall be to enhance quality of education, the modes of providing it within Higher Learning Institutions and to make sure that those graduating from such institutions, including distance learning, are knowledgeable for the betterment of the welfare of Rwandan residents and the development of Rwanda. The extract below reflects this:

*“...to enhance education and research in the higher learning institutions...to set norms and standards for accrediting private higher learning institutions; to monitor the adherence of norms and standards in higher learning institutions; to compare, evaluate and give equivalence to degrees and certificates of higher education level delivered by foreign institutions and those delivered in Rwanda that need authentication including those awarded through distance learning...”* (Republic Of Rwanda, 2013b)

According to Law N° 27/2013 of 24/05/2013, governing organisation and functioning of higher education, the main responsibilities of institutions of higher learning include the following: to design programmes and provide higher learning education so as to award undergraduate, graduate or post-graduate degrees and diplomas in various fields; to carry out and promote research in all scientific and technological disciplines and on various problems at the national and regional level and worldwide; to publish research results and to collaborate with other organs to ensure their dissemination in order to contribute to the promotion of development at the national and regional level and worldwide. The responsibilities of higher education institutions include the use of technology as reflected in the passage below:

*“...to carry out and promote research in all scientific and technological disciplines and on different problems at the national and regional level and worldwide... to provide the student with knowledge, skills, technology and*

*education for self-confidence and self-employment” (Republic of Rwanda, 2013a: 18-19)*

According to the HEC (2013), the government supports the transformation of higher education to make it fit for purpose and internationally credible. Higher education institutions are required to deliver graduates, research, consultancy services and community engagement to support the social and economic development of Rwanda. In its mandate, HEC (2014) conducted a workshop to take stock of capacity-building needs in pedagogical skills for the 2014/2015 fiscal year. Issues emerging from the workshop include integration of ICT in education and training of the academic staff in various areas, as reflected in the passage below:

*“That academic staff be trained in... Integrating ICT in teaching and learning and assessment...Utilising blended mode of delivery to offer the training. That Higher Learning Institutions commit themselves to the implementation of Pedagogical Skills training for academic staff.” (HEC, 2014: 1-1)*

#### 4.8.5.3 Transformation of nursing and midwifery education and practice

**Establishment of the National Council of Nurses and Midwives:** The National Council of Nurses and Midwives (NCNM) was established by Act of Parliament N° 25/2008 of 25/07/2008, promulgated 1 November 2008, to regulate nursing and midwifery professions for public protection by ensuring that nurses and midwives are capable of providing safe and effective care as well as safeguarding the integrity of the profession.

*“This Law establishes the National Council of Nurses and Midwives and determines its organisation, functioning and competence...The National Council of Nurses and Midwives, hereinafter referred to as the National Council, has legal personality, administrative and financial autonomy.” (Republic of Rwanda, 2008: 8).*

In this study, document analysis indicated that until recently, nurses and midwives in Rwanda had varying degrees of knowledge, training, and capacity as reflected in their qualifications. Some had received inadequate instruction abroad and others had even bought counterfeit diplomas. Because there was no system in place to ensure that nurses were adequately prepared, many Rwandans were subjected to inconsistent care and unreliable service quality. In 2011, with help from various stakeholders, the NCNM developed standard criteria for registration and licensing and designed a national database with information on health workers’ qualifications and clinical experience. The passage below shows this:

*“Acceptance for registration shall be granted after the National Council is satisfied that all the requirements for registration are fulfilled. If all the requirements for registration are fulfilled, the nurse or midwife shall be registered in the appropriate part of the register and he or she shall be issued, by the National Council, renewable professional licence and certificate of registration.”* (Republic of Rwanda, 2011: 28).

**Determining the scope of practice of the profession of nurses and midwives:** Ministerial Order N° 20/25 of 18/04/2012 determining the profession of nurses and midwives (Republic of Rwanda, 2012a), highlights the importance of having skilled nurses and midwives in relation to the following issues and activities: readiness or preparedness to give an explanation or justification to relevant others for one’s judgments, intentions, acts and omissions, when appropriately called upon to do so; moral authority and attributes that enable a nurse or midwife to practice independently using his or her specialised knowledge, skills and ability to analyse a nursing/midwifery care situation, and take appropriate action while remaining accountable for that action; clinical judgment (arriving at a clinical decision after assessment of alternatives). This law indicates the scope of practice of each category of nurses and that an associate nurse (A2 level) has limited responsibilities compared to registered nurses.

**Ministry of Health 2012–18 strategic plan on education:** The Ministry of Health strategic plan of 2012-18, indicates a comprehensive transformation in nursing and midwifery education, in which nurses with A2 level need to upgrade their levels to A1 level. Because the nursing schools are small and have insufficient teaching capacity to meet an annual intake of 250 students, the capacity of teaching institutions (TIs) will be strengthened by increasing the number of TIs, expanding infrastructure, equipment and staff, and further development and training of teaching staff. Following the introduction of an e-learning system in the nursing schools, the number of A2 nurses who have completed the e-learning course to upgrade their skills will be increased to 1,488 by 2017–2018; to achieve this, support from Rwanda HRH was deemed a necessity. The quotes presented below reflect this:

*“For nurse and midwifery training, there are currently five nursing schools (Byumba, Kabgayi, Kibungo, Nyagatare, and Rwamagana) under the MOH, and responsible for A1 nursing and midwifery education, which is now the minimal acceptable standard for nurses and midwives. This means that most A2 nurses and midwives will need to upgrade to A1.”* (Rwanda Ministry of Health, 2012b: 58).

*“In order to meet the desired HRH norms and standards, substantial efforts are needed to increase the quantity of health professionals...improving and*

*maintaining quality of the health professionals will receive great emphasis through strengthening of the professional bodies to monitor and evaluate the TIs for quality of training, accreditation, and best practices.”* (Rwanda Ministry of Health, 2012b: 58).

**Introduction of e-learning system in nursing school and midwifery schools:** In this study, document analysis indicated that the project of introducing e-learning in nursing schools was initiated by Ministry of Health in partnership with various stakeholders, with the main purpose being to upgrade the level A2 Nurses (Diploma) to A1 level (Advanced Diploma). The introduction of e-learning schools was regarded as a national need (Rwanda HRH, 2011) and had the following objectives: to improve nurses’ and midwives’ knowledge and skills using modern methods of teaching and learning; to equip various health settings with well-trained and qualified nurses and midwives; to contribute to the reduction of infant and maternal mortality rate (refer to MDG # 4 & 5); to upgrade and qualify a target of 5000 nurses and midwives using e-learning by 2020. The passage below reflects this:

*“The e-learning program is designed to adapt to the learning needs of nurses and midwives who are already working, but who are in need of further training. The curriculum design is catered to these stipulations, making the program attractive to these targeted candidates and making it highly likely that they will successfully graduate.”* (Rwanda HRH, 2011: 19)

#### 4.8.5.4 Partnership with other higher teaching and learning institutions

The government of Rwanda, in partnership with US universities through the Human Resource for Health program, is working on increasing workforce numbers in nursing and midwifery, as stated in Rwanda Human Resources for Health of 2011 to 2019. A number of US universities (Duke University, Howard University, New York University, University of Illinois at Chicago, University of Maryland, University of Texas, and University of Virginia) are partnering with CMHS-UR nursing midwifery schools to carry out the upgrade.

For nurses and midwives, the HRH Program is heavily focused on raising the skill level of the workforce. Historically, there have been three levels of training for nurses and midwives in Rwanda: A2, A1, and A0. A2 level nurses and midwives are trained to secondary school level, while A1 nurses and midwives have an advanced certificate following three years of school. A0 nurses and midwives have a bachelor’s degree and often become faculty members. Beginning in 2006, the Ministry of Health stopped training and deploying nurses and midwives of A2 level, deeming their skill sets insufficient to provide quality patient care. The minimum

requirement for a Rwandan nurse is now A1. The HRH Program builds on the Ministry of Health's effort to upgrade the skill levels of existing A2 nurses and midwives, as well as dramatically increasing the production of new A1 and A0 level nurses and midwives. The Ministry of Health has developed educational pathways for nurses and midwives to advance from A2 to A1 to A0 levels in an efficient sequence, raising the overall skill levels of the nursing and midwifery cadre in the country. In the past, there have been three levels of training for nurses in Rwanda A2, A1, and A0. A2 level nurses finish secondary school, A1s attend three years of nursing school and A0 nurses hold a bachelor's degree. The Government of Rwanda has ended the A2 level program and plans to upgrade all A2 nurses to A1.

**Table 4-23: Paths to nursing education (to advanced diploma) in Rwanda adapted from Mukamana et al. (2015)**

YEAR 1	YEAR 2	YEAR 3
Direct entry from high school	Selection of Midwifery, General Nursing, mental health	Advanced Diploma Complete the course
A2 nurses full-time join the program	Selection of Nursing or Midwifery	Advanced Diploma Complete the course
A2 nurses join the program through e-learning	Continue	Advanced Diploma Complete the course

Government in collaboration with HRH will increase the nursing workforce, and a total of 4,298 A1 nurses and 907 A0 nurses will be trained through the HRH program. In addition, government will dramatically increase the number of master's level nurses in Rwanda, from only 17 in 2011 to 120 by 2019 (Rwanda HRH, 2011). However, for the purpose of this study, the focus is on the upgrading of A2 nurses to A1 nurses (with Advanced Diploma in e-learning) where Rwanda HRH program is projecting a number of 2952 nurses having upgraded their levels from A2 to A1 level by 2019 in seeking to assist the country to achieve the objectives of Vision 2020 (Rwanda HRH, 2011).

The e-learning program for nurses and midwives as supported by Rwanda HRH is a strong example of the Government of Rwanda's approach to facilitating skill upgrades in health workers in a way that will maximise recruitment and retention of trainees. The e-learning program is designed to adapt to the learning needs of nurses and midwives who are already working but in need of further training. Stipulations shaping the curriculum design were that the program must be made attractive to these targeted candidates and must make it highly likely that they will successfully graduate. Similarly, the health management program at the School of Public Health seeks to encourage enrolment of existing health workers who are in positions that require management training. While they are enrolled in the CIHM certificate program,

they will be supported in continuing their responsibilities, and will be able to return to these positions with a highly-applicable skill set at the conclusion of the program (Rwanda HRH, 2011).

#### **4.8.6 Action/interaction strategies**

Strauss and Corbin (1990) explain that action/interaction strategies are directed, purposeful and goal-oriented measures taken in response to, or to manage, a phenomenon as it exists under a specific condition. Strauss and Corbin (1990) also explain the properties of action and interactional strategies. Firstly, they are processual and evolving in nature. This suggests that the phenomenon can be studied and described in terms of a sequence or change over time. Secondly, the action and interaction strategies need to be goal- or purpose-orientated; this suggests that the interactions are in response to something and thus occur through tactics or strategies. Thirdly, Strauss and Corbin (1990) indicate that failed interaction strategies are equally important to understanding and analysing the depth and dimensions of the phenomenon. Actions that should have been taken within or under a particular circumstance but were not taken also need to be explored to understand the implications this has in relation to the studied phenomenon.

Based on analysis of various data sources, this section describes the activities that took place during field study on the utilisation of e-learning platform in nursing schools; four themes emerged: (a) establishing a shared vision (e-learning as a framework to use in nursing education); (b) nature of the teaching and learning environment (campuses as providers of raw content; campus environment as a setting for testing a middle-range theory developed); (c) planning effective use of a learning management system (Moodle); (d) facilitation in using LMS as part of e-learning.

##### **4.8.6.1 Establishing a shared vision (E-Learning as a Framework to use in Nursing Education)**

Establishing a shared vision was viewed as important. A shared vision helped the researcher, research team, nurse educators and other stakeholders to stay on track while working towards the common goal, and accordingly to set priorities in practice development work. Most of the team members participating in this study reported that reflecting on the vision and on core values helped them to become aware of what was requested and to be able to internalise the direction for a change. Moreover, it supported their engagement with the same goals in the

transformation of practice. As a result, they were able to focus their energies and work in the same direction. In this study, the researcher and the research team from three campuses, campus managers, students, ICT managers, teachers and stakeholders all had a common understanding of the need to conduct a study on the use of an e-learning platform, and on giving their support during the whole process of the study. This common understanding with the various categories of participants involved in this study promoted mutual collaboration and support, and everyone wanted to be to contribute based on his knowledge. Data from interviews and focus group discussion indicated that the researcher had provided all necessary information on what core elements were needed to analyse the use of e-learning in nursing and midwifery education. The quote presented below reflects this:

*“We have found the topic very interesting and we are confident that your contribution to Nursing and Midwifery Education in Rwanda will be of great value....”* (Dean of the School of Nursing and Midwifery/CMHS-UR)

*“I can share or suggest you [researcher] ...there are some training that are not sufficient...avail your time and train people without considering to be facilitated that could be good...training the staff. Endnote, SPSS most of them, they don't know them, and this can facilitate in an e-learning system.”*

**(TP2)**

#### 4.8.6.2 Nature of the teaching and learning environment

**The school as a provider of raw contents:** Data used in the analysis process and the development of middle-range theory was based on information obtained from the participants and from stakeholders in the College of Medicine and Health Science. The participants contributed authentic learning problems and experiences on the use of the e-learning platform which guided the development of the middle-range theory.

**The school environment as a setting for actions and interactions:** After identifying what should be done to address the problems related to poor utilisation of the e-learning platform as part of e-learning, the school became an environment for carrying out actions. The rationale for carrying out actions in the particular school was that the participants from the selected school provided the real problems and challenges in the use of the e-learning platform and in particular the use of Moodle as a learning management system.

#### 4.8.6.3 Negotiating with the stakeholders and gaining their support

Negotiating with the stakeholders and gaining their support emerged as an important step for action/interaction strategies for the future sustainability of e-learning. The findings indicated that e-learning at the selected nursing school was facilitated by various stakeholders; this was after Moodle had been down for the whole year in 2014. The researcher contacted a number of stakeholders, physically and via electronic communication. The researcher explained the purpose of the study and the importance of their collaborative participation, as the study was guided by participatory action research. The stakeholders provided useful information on Moodle and e-learning platforms in general, such as how they facilitate e-learning and problems and challenges they encountered. All stakeholders assured their support during the whole process, as it would bring a positive change in the way e-learning is done. One of the stakeholders put the researcher in contact with experts who were not on the ground. This was helpful as we continued to communicate throughout my study. The communication presented below reflects this:

*“I want to connect you to all the people locally that will be involved in E-Learning at the University of Rwanda. The university is in the process of hiring a new person to facilitate the E-Learning in the School of Nursing and Midwifery. He currently lives in South Africa but will be moving to Kigali in the New Year. He is just finishing his PhD in Distance Education and is really well qualified. His name is Alexis Harerimana...Maybe we could all have a Skype call once your new Tulane person is on board and review where we are and where we need to go.” (Expert from HRH)*

#### 4.8.6.4 Planning effective use of learning management system

The findings of this study indicated four categories in the process of planning the envisioned middle-range theory: (i) conceiving the idea of developing middle-range theory, (ii) negotiating with stakeholders and garnering support, and (iii) collaboratively establishing a shared structure.

**Conceiving the idea of developing a middle-range theory (MRT) to guide the use of e-learning:** In the current study, the idea was considered of developing a middle-range theory to guide e-learning in the selected nursing school. The shared experiences of the participants made the need for such a middle-range theory apparent. Through collaborative discussions, participants identified some of the challenges they faced with the e-learning platform in nursing and midwifery education: inadequate training and preparation in using an e-learning platform,

in particular Moodle, as a learning management system; low level of computer literacy of teachers and students; shortage of teaching staff for e-learning; insufficient time to finish the course (expressed by students and teachers); big number of students; not enough equipment for e-learning; breakdown of Moodle (Moodle frequently breaks down because of sporadic electricity supply in some schools); poor use of Moodle by students and teachers; lack of facilitation of the student via Moodle; inaccessibility or lack of internet at home and or workplace for both students and teachers; inadequate equipment for video conferencing; no soundproofing; the only computer lab also used for video conferences; no motivation for lecturers (who regard e-learning as an addition to their workload, even though it is for their support, considering their working hours that include nights and weekends); excessive workload of students and teachers; poor library, without sufficient online books and journals; insufficient classrooms to accommodate all the students; language barriers (in English) for students; financial problems when attending face to face. The comments presented below reflect this:

*“MOODLE has been down most of the time in the previous years...and when Moodle started in 2012...It was down most of the time...Moodle has not been working for 1 year in 2014. Regarding the policies...not much policies in terms of using e-learning and Moodle...yeah... there are challenges related to internet that is slow, or sometimes down, there is lack computer literacy among students, language barrier [students don't master English], and on how to engage an online discussion, and of course the electricity (disruption)...There is also lack of training among nurse educators and students on the use Moodle...and not much in terms of policies of e-learning.” (FGD-P2)*

*“Sometimes there is a problem of network...The big number of students in the class is a problem and changes the way you teach... A big number of students is a big challenge to use e-learning program, and to explain to each student.” (TP1)*

*“Frequently Moodle breaks down, due to the facts that electricity in some schools is sporadic, and sometimes this limits the number of users. Some schools don't have generators which is a problem for video conferencing, online exams and courses. The equipment for video conferencing is not sufficient, there is no sound proof, and the same only computer lab is used for video conferences...Poor library and no sufficient of online books and journals.” (TP20)*

*“ Another challenge that we have is that we don't have enough skills in training these e-learners, we are not educators, you know, and ...we try to get some training on how to design a course syllabus and whatever, but still*

*the platform has been changed, and we don't have additional training on the new platform.” (TP18)*

*“...the time is short...and in that short time we have to complete a lot of things...that was a challenge... another challenge is like financial problem...about...you see most of the people they need to have computers and whatever...some people are not capable of buying these computers.”*

**(SP15)**

On this point, participants indicated a number of challenges in conceiving and developing a middle-range theory. This involved an action-orientated approach, and it was apparent that planning for the middle-range theory needed cooperation from all stakeholders. In addition, because e-learning is new in nursing and midwifery education in Rwanda, the idea of developing a middle-range theory (which was also new, and appreciated) needed to be collaboratively embraced by all stakeholders to achieve full participation and ownership; it also needed to be directed by a leader or facilitator who had some knowledge of the concept to direct and guide the stakeholders in understanding the envisioned idea.

**Negotiating with key stakeholders and garnering support:** Negotiating with key stakeholders and garnering support was considered important for promoting a greater sense of ownership and agreement in the processes, which usually results in improved effectiveness. Positive outcomes and improved efficiency are more likely to be achieved when conflict stakeholders' knowledge and skills are engaged, and when energy, resources and activities are put into the process it raises the likelihood of good outcomes. Data sources indicated that garnering support promotes improved sustainability and impact, and an agreement is more likely to be adhered to when those involved are themselves responsible for it. In this study, seeking to promote ownership and partnership and solicit support for development of a tool to guide all users of e-learning in the selected nursing school, the researcher approached the relevant stakeholders, comprising ICT managers, nurse educators, Director of the Centre for Teaching and Learning Enhancement (CTLE) at CMHS-UR, the advisor for distance and e-learning for nursing, and the administrator of the Moodle platform. In the course of activities involved in planning and preparing for change, it was found from the data sources that e-learning was used, and in particular the Moodle platform. Also apparent from the data was the positive reaction of the stakeholders in allowing the researcher to have access to data from three selected nursing campuses where the study was conducted.

In garnering support and facilitating the relevant stakeholders to take ownership in the planning process, the researcher provided a platform for open discussion in the initial data-collection

sessions in the form of individual interviews with nurse educators and focus group at the main campus of the selected school, including also an expert/advisor on nursing programs for distance learning and e-learning. Here the researcher guided the dialogue by sharing the information with the stakeholders. In these discussions expectations from the researcher's study were high. Because the various stakeholders were located in different countries, electronic communication via emails and chatting on Moodle was very useful.

**Determining the focus of action and collaboratively establishing a shared structure:**

Collaboratively establishing a shared structure in planning was regarded as crucial for an effective and meaningful nursing education program. It was apparent from participant responses that there was a need to train both nurse educators and students in using Moodle as a learning management system. The stakeholders and the researcher agreed, with a date and venue set for the training and decisions taken on what to emphasise, on the duration of the training, and how it would be conducted.

**4.8.6.5 Facilitation of LMS use in e-learning**

**Training nurse educators on the use of Moodle:** Designing and implementing successful professional development programs for teachers in the application of technology is important for the success of e-learning. Technology increases teachers' training and professional development needs and it also offers part of the solution. ICT can improve in-service teacher training by providing access to more and better educational resources, offering multimedia simulations of good teaching practice, catalysing teacher-to-trainee collaboration, and increasing productivity of non-instructional tasks. ICT can also enable in-service teacher professional development at a distance through asynchronous learning and individualised training opportunities, and ICT can overcome teachers' isolation, breaking down their classroom walls and connecting them to colleagues, mentors, curriculum experts and the global teacher community on a continuous basis.

Taking into account the difficulties experienced by nurse educators in using Moodle, a training event was organised which took place at the main campus of the selected school. Fifteen nurse educators were invited to participate in the Moodle training workshop, via e-mails from the office of the dean of the selected school. The one-day training workshop took place on 25 September 2015 at a venue on the main campus of the selected school. The dean of the selected school opened the workshop and invited the researcher and an expert to begin the workshop.

After introduction and welcoming of participants, the training began by assessing what the participants knew about the Moodle learning management system used in Rwanda. Presentations were made on various aspects of Moodle, followed by demonstration and counter-demonstration. The participants were encouraged to exercise frequently during the training. The researcher and an expert in distance learning facilitated the process. A number of questions were asked which gave rise to more categories. After the training, the researcher and the experts reflected on the training and action going forward. The experts in distance learning, and the selected school gave full access to the researcher and privileges to monitor in selected campuses to see if participants put into action what they had learnt and to collect further information on how Moodle was used at the selected campuses. This follow-up was done in the monitoring and transitioning phase as described below.

**Monitoring and transitioning phase – an awakening of consciousness:** Data sources indicated that evaluating the implementation of strategies and assessing what was accomplished is an important part of the action strategy process. It can be done fairly simply by tracking activities and progress toward meeting objectives in the action plan. In this study, after the training of nurse educators on the use of Moodle, it emerged from the data that participants moved from the learning phase to a reflecting phase, and interactional strategies and activities became apparent which are collectively described as a transitioning phase. Within this phase, the data revealed that the participants transitioned from being non-reflective and learning how to reflect, to a stage of new awakening and mindful realisation in relation to using the e-learning platform.

In this study, the use of Moodle was monitored in collaboration with nurse educators, experts in distance learning, and experts in adult education who were involved in the planning process. Moodle provided useful information which helped to inform nurse educators, and continuously information was exchanged with all stakeholders via e-mails and chatting on Moodle.

In the process of monitoring, a number of observations were made, such as log reports, course blogs, notes, activity reports, course participations, activity completion, statistics, interface design of Moodle, and troubleshoots of Moodle in general. To keep a record of the gathered information, screenshots were taken continuously for a period of three months. This monitoring allowed the stakeholders to identify and give feedback about active and non-active users, inadequate posting of notes and assignments, the frequency of forum discussion and their quality, students' online engagements, nurse educators' facilitation of teaching and learning,

and issues related to signing in to Moodle. On a few occasions, Moodle troubleshooting with automatic messages was detected and the Moodle administrator and other stakeholders were immediately informed. The problems resulted from the upgrading of the Moodle database. Data sources revealed that Moodle as an LMS depends heavily on databases to store structured information about the users and all of the features the LMS provides. Problems in the database can therefore lead to poor performance in the LMS. The monitoring phase was based on communication and technical assistance of nurse educators. Data emerging from Moodle analysis indicated that some teachers had begun to put into action the directions given to them during the training on how to use Moodle. Although the change was apparent, data collected indicated that some teachers were not yet actively engaging the students. Some teachers began engaging the students on the platform based on data the researcher had initially collected, and some suggested ignoring the earlier data in favour of the most recent data. The researcher explained to them that the old data would be used to compare whether there had been any progress after the training on Moodle. The participants were happy with this clarification, as the comments below from the Moodle chat room indicated:

*“Thanks a lot for more clarification...I am working on Moodle without any problem. That is very wonderful to hear that you will be assessing the use of Moodle by our schools...I started putting the exact course on Moodle...students are enrolling themselves in the course from today to be able to access the course...I hope on Monday most of the students will be enrolled in my course and participating actively in the course as well as more materials and activities will be ready. I wish you to make another assessment of my course so that you will see how far we are using Moodle and get the relevant data. In addition, your support for helping me to improve the use of Moodle is highly welcomed.” (Teacher from Campus A)*

*“I am really glad if you had a refresher course in terms of using Moodle, because this will increase its utilisation... that was a wonderful initiative! Keep it up ... you are doing a great job...keep encouraging other teachers to use Moodle platform. For those who were not present during the training you mentioned, kindly train them and make sure they use it. I will be monitoring you... and see if the training has brought a great impact. If some of the teachers continue to face problems in terms of logging in or updating the information, or following the students, let me know. Together we may find solutions.” (Response by the researcher)*

#### **4.8.7 Intervening conditions**

According to Strauss and Corbin (1990), intervening conditions are a set of broad and general conditions which facilitate or hinder the action and interactional strategies. In this study, several

intervening conditions emerged from the data sources which both facilitated and inhibited utilisation of the e-learning platform in the selected nursing school.

#### 4.8.7.1 Facilitative intervening conditions

The sub-categories which emerged as facilitative conditions were (a) institutional support for teachers and students, (b) partnership and collaboration, (c) policies and regulations of e-learning, (d) effectiveness of learning management system (Moodle), (e) e-readiness, and (f) bridging the digital divide.

#### **Institutional support for teachers and students**

In this study, it surfaced that support is pivotal to the continued success and growth of e-learning in higher education. E-learning is learning facilitated and supported through ICT. Data indicated that e-learning is used within a spectrum of activities, such as supporting learning as part of a 'blended' approach for on-campus students in which traditional face-to-face and e-learning methods are combined. The success of e-learning depends on institutional support for teachers and students. The strategic approach to the development of e-learning, while recognising the opportunities for students in general, brings particular benefits for distance-learning students through its ability to provide support in an increasingly coordinated way.

Based on the pedagogical design of e-learning, supportive activities emerging from the data included the development of e-learning modules at each level of the programme in relation to national needs and available resources, providing e-learning opportunities for teachers' facilitation and students' engagement, effective teacher and student monitoring and evaluation, ensuring significant growth and retention in the number of students enrolled in e-learning, and extensive staff and student capacity building. Although the institution had taken steps to streamline its e-learning management and operational structure, with the assistance of stakeholders such as Rwanda HRH, the institution considered moving to a more centrally coordinated approach to the provision, utilisation and quality assurance of e-learning. It emerged from various resources that support was being provided to nurse educators and nursing students by their institutions and stakeholders for effective facilitation of e-learning in nursing education.

Data revealed that in the technological design of e-learning, technological material resources, technical support, and well-trained nurse educators were pivotal to success. Support ranges

from technical support provided by ICT managers who assist both teachers and students when there is a network problem, computer problems or problems with access to Moodle. Data revealed that the institution provided modems and airtime to teachers during teaching periods, in addition to provision of training students and teachers in using Moodle, provision of Internet at campuses with (wireless) access for both students and teachers, and provision of an ICT laboratory, projectors, and electricity. Currently, there is stable Moodle compared to the past, and each computer laboratory from each campus is equipped with at least 30 computers.

It emerged from this study that a positive environment was in place for e-learners and teachers in the e-learning system. For nurse educators, the e-learning environment helped them to increase their knowledge both pedagogically and technologically. Mainly, however, the supportive environment was related to collaboration with the students: developing a group agreement that sets the parameters for class discussions, acting as a facilitator in conversations to help generate multiple viewpoints, and valuing all student contributions - making this known even to those who are shy. Nurse educators noted that some students were comfortable in sharing their ideas, and responded by creating groups or pairing shy students with pro-active students and by making sure that all the students got an opportunity to speak. Some participants, responding to the supportive environment, commented that if given another chance they would enrol again in e-learning program after they had completed their advanced diploma. The comments presented below reflect this:

*“The support system is the infrastructure... we have a computer laboratory that is available to everyone...lecturers and tutorial assistants have been trained before, even the students have gone the training.” (TP2)*

*“Yeah the institution supports us when we are in a teaching period, they can give you the air time, and modem... when you are in a teaching period...in order to interact with the students. Yeah in that time they can support you.” (TP5)*

*“...for example we are having IT [specialist]who is more trained on how Moodle is used, when we are having some difficulties that IT comes and helps us to solve that problem ...when we are having difficulties in enrolling the students we can approach the IT.” (TP 19)*

*“...at the beginning there is the person who guides us...to enter in that program... and to teach us how to use these machines (computers)...there are the machines in this institution that help us to begin and to continue to use these programs.” (SP2)*

*“...there are those ones who are shy, there are others who wants to participate and explain themselves...so to make every student participate I*

*like to make that participatory so that even the one who was afraid to explain himself will be able to express himself...and we are going to understand his ideas and from there we can correct him and encourage him.” (TP10)*

### **Partnership and collaboration**

The findings from this study indicated that the initiative in Rwanda of partnering with other higher learning institutions and other countries in the field of education, and particularly in the health sector, has been fruitful. In particular, collaboration with Rwanda Human Resources for Health (HRH) has been fundamental for nursing education – above all in establishing e-learning in nursing and education through the partnership with the Ministry of Health. Document analysis indicated that in this program faculty from the United States teaching institutions (USF) "twin" with Rwandan faculty (RF) to transfer skills in view of the shortage of health professionals, particularly in speciality areas. Data sources indicated that through this partnership, stakeholders provide technological and pedagogical assistance as well as financial support for the nursing and midwifery school. It also emerged that US educators partner with their Rwanda counterparts. Goals are set depending upon departmental needs, personal interests, and the competencies of the twins.

Data sources from this study indicated that over the last three years 114 foreign nursing and midwifery educators have been appointed by HRH to work in Rwanda. Each of them has committed to at least one full year of teaching in Rwanda. Currently, 36 US nursing and midwifery educators are twins to 72 Rwandan college faculty. The twinning model was developed to enhance effective transfer of knowledge and skills. This HRH program has enabled Rwanda to attract high-calibre faculty from the US institutions (USI), including those with masters and doctoral degrees. Their collaborative mentoring and teaching have made significant inroads and helped to improve the education of nursing and midwifery students and the clinical care for Rwandan patients. The following extracts from document analysis indicate the benefit from this partnership with US teaching institutions:

*“There are two categories in the HRH faculty: leadership, management, and strategy (LMS) and clinical educators. Faculty in the LMS positions work with Rwandan faculty in education and clinical leadership and management positions...Speciality advisors within this LMS group are primarily in the SONM and they include an E-learning Advisor (providing education on online course development for five district schools of nursing and midwifery).” (Mukamana, Uwiyeze and Sliney, 2015: 11)*

*“All of these faculty members provide expert guidance and teaching in their designated areas. Their efforts are geared towards capacity building of Rwandan faculty and practitioners by mentoring, teaching, training, and providing various learning experiences for Rwandan nurses and midwives.”*  
(Mukamana et al., 2015: 11)

Data also revealed that digital public library and archive services were established by RDB in partnership with volunteers from Korea International Cooperation Agency (KOICA), setting up a digital e-library to be used in all the 30 Business Development Centres (BDCs), also known as multi-purpose telecentres, countrywide. Physical libraries at telecentres will be equipped with Samsung Galaxy Tablet computers which provide a suitable way of accessing information. The digital library project is expected to boost the development of a “knowledge-based economy” in Rwanda, as these digital platforms will be introduced across the country (Republic of Rwanda, 2015a: 20).

### **Policies and guidelines**

Data sources indicated that for effective integration of ICT in national education systems, policy and guidelines need to be established. Policy not only puts ICT in context but also motivates teachers to make adequate use of ICT and more generally bring about change. Data from this study showed that e-learning policy and guidelines should demonstrate a commitment to high-quality educational practices, and should encourage faculty to work together to develop a set of discipline-specific best practices in online teaching and learning rather than forcing online/hybrid teachers to adhere to a prescriptive set of guidelines or follow specific, rigid models. Policies provide a guide for classroom utilisation of ICT relating to computers and other hardware, computer programs (software), Internet and networking, legal issues such as plagiarism and copyright, payment of incentives for nurse educators and ICT managers, additional professional development opportunities and peer recognition. For the success of e-learning, faculty need to adhere to these policies and regulations, thereby enhancing teaching and learning as well as instructor and student satisfaction.

Data sources indicated that the ICT policy developed by the Rwanda Ministry of Education seeks to build a shared understanding and synergy among all stakeholders on what ICT in education means, with the following priorities: creation of an enabling environment, mechanisms and priorities for ICT in education; development of modern, relevant content fulfilling the needs and expectations of citizens, industry and society in general; harmonisation between centralised and decentralised levels of the education system; leveraging public-private

partnerships and support of development partners; and strengthening Rwanda's effort to export ICT in education models to Africa in general and to the EAC and COMESA in particular. The policy also specifies the duration of face-to-face and online instruction. Face-to-face instruction accounts for 40% of the academic year while online instructions and self-directed learning account for 60%. The extracts below indicate this:

*“The ICT in education policy is designed to guide the process of harnessing, deployment and exploitation of ICTs within the Education Sector to support its organisational activities and operations within the framework of the national ICT-led development vision.”* (Rwanda Ministry of Education, 2016: 8).

*“...the policy says that in 60%, students have self-directed learning, guided, and assisted by the lecturer, or tutorial assistant...and 40% is face to face...this policy have an impact which is big because it is the one who at least helps those ones who are working to upgrade their levels.”* (TP2)

### **Functionally effective learning management system (Moodle)**

In this study, it surfaced that Moodle was the learning management system used in Rwanda. Moodle serves as a learning platform, which is a set of interactive online services that provide learners with access to information, tools and resources to support educational delivery and management through the internet. Moodle promotes a collaborative approach and helps educators create online courses with a focus on interaction and collaboration. Numerous modules extend its functionalities, such graphical themes, authentication and enrolment methods, games and activities, and resources. Moodle has a number of features which offer a variety of teaching and learning: learning content management, creation, storage, access to resources, curriculum mapping and planning, lesson planning, personalised learning experience, assessment, learner engagement and management learner information, progress tracking, tools and services forums, messaging system, blogs, and group discussions.

The study found that the Moodle learning management system introduced by the Rwanda Ministry of Health as part of the e-learning program stopped working in 2014 due to various problems, but has, since early 2015, been running well again as manifested by the data from Google Analytics and from log reports, and has appropriate security, as observed by the researcher from Moodle. It emerged from the data that this was achieved with the partnership with RHRH (Rwandan Human Resource in Health), and the University of Rwanda. Currently,

Moodle is accessible and being used by some teachers and students, and they use it as a tool for teaching and learning, and even for evaluations. The comments presented below reflect this:

*“...in this year I am able to use Moodle...I am able to use Internet...in our practices that is evidence-based practices.” (SP1)*

*“...on Moodle I try to give the assignments, and I collect them on Moodle, I post some courses, some videos on Moodle so as to improve the online teaching and learning... so some teachers use Moodle... they post some outline courses, they put assignments, the forum discussion.” (TP4)*

In analysis of Moodle by the researcher a number of points were noted for improved utilisation of the e-learning platform: appropriate use by teachers in facilitating the students; good management access rights for the data on Moodle (for example, limited privileges for students, teachers, campus manager, etc.); appropriate security for access to any course; rapid response from the Moodle administrator in case of difficulties; the Moodle learning management system as a cornerstone of the future of nursing and midwifery (based on the log reports in some courses); access to Moodle is easier and mobile friendly (depending on the Internet network).

### **E-readiness of institution, teachers and students**

It surfaced from this study that successful online learning depends on the online learning readiness both of the learners and teachers and of the institution. Therefore, it is necessary to assess the state of readiness of students, teachers and the organisation in relation to the implementation of an e-learning environment. Data sources indicate that the readiness criteria provide a goal for the institution as it develops its capability to implement an online learning environment. Being able to assess where the institution is currently positioned in relation to where it envisions itself to be is already a significant milestone. Having this vital information puts the institution in a position to develop strategies and timetables for achieving readiness in all the categories identified.

Data sources indicated that effective implantation of e-learning requires institutional readiness, student readiness, and teacher readiness. These three conditions are interrelated, and if one is missing or inadequate e-learning facilitation and success becomes problematic. Institutional e-readiness signifies how prepared the institution is in terms of using ICT in the sphere of education. It signifies the ability of the institution and the capacity of institutional stakeholders (managers, key ICT persons, teachers and students) to generate e-learning opportunities by facilitating computer-based technologies and how e-ready the institution is to benefit from

educational technology. Nurse-educator e-readiness depends on the preparedness, knowledge and skills of the educators to use instructional and technological design in their daily activities. E-readiness for nurse educators is also concerned with ease of using technology and necessary investments in infrastructure, but also assumes a degree of administration support of e-learning. It is also important to be educationally ready to use e-learning with nurse educators being motivated and having had frequent and adequate training. The motivation might be incentives or other forms of recognition of the job done, as many consider the use of technology as an extra task; overall nurse educator readiness is about teaching styles and educational needs satisfaction.

Nursing students need to be prepared in order to adopt e-learning and benefit from its advantages. E-learning readiness for students is determined before teaching institutions introduce e-learning and relate to their ability to adapt to technological challenges, collaborative learning, and synchronous as well as asynchronous self-paced learning. This depends on students' having the necessary motivation and discipline to learn in a self-driven mode and to respond to online instructions. Student readiness for use of technology involves the availability of infrastructure, clear training objectives, trainer support and guidance, and knowledgeable leadership. The comments below indicate the importance of e-readiness:

*“The institution should be ready first, they should get prepared enough, they should be equipped with e-learning tools ...I think we should have enough staff, trained staff who are ready to teach online, the government should supply enough ICT tools, like computers, to increase the strengths for connection of Internet.” (TP16)*

*“ ...the school should be prepared, the teachers also, and the students...” (TP3)*

*“...every student has her laptop, and Internet connection, so some teachers use Moodle... they post some outline courses, they put assignments, the forum discussion.” (TP4)*

*“...during the time of face to face, not just the lecturer prepared the content to deliver to the students but also they participate through assignment, through group works...and during online sessions, each student is having its part to be connected to participate.” (TP6)*

Data sources indicate that perceived usefulness of e-learning on the part of stakeholders determines their actual readiness for it in their teaching and learning activities. Data sources indicate that e-readiness is associated with learning outcomes of e-learning. High-quality e-learning programs provide outcomes such as becoming familiar with ICT, upgrading the level

of students, producing competent and critically thinking graduates, accessibility of academic resources irrespective of the time and distance, and lower costs for learners, learning institutions and teachers. Data sources indicated that e-readiness is also related to learning outcomes such as personal benefit for the learners in that they do not experience the personal stress resulting from financial risk, leaving a job, or moving themselves or their whole family to be close to an academic institution, and in providing a program in which learners are satisfied with the learning experience and acquire new and relevant skills and knowledge, from which they can apply new knowledge and skills in their workplace, and add value to the services delivered by them. The comments below reflect this:

*“They are some changes...do you see we are in vision [Vision 2020] ...before we didn't know how to use the laptops, the Internet...now we use the data from Internet...if you meet a challenge on the disease which you don't know...you can go and you read yourself.” (SP8)*

*“...you see we are going in the vision [Vision 2020] to use ICT...for us students who use e-learning program... we have enough knowledge.” (SP4)*

*“...when you use the Internet you do more research...and gain more knowledge.” (SP14)*

*“...it [e-learning] will increase critical thinking very well because at the beginning we had not enough information... we increase our skills and knowledge...even here in practice we use Internet connection to increase our knowledge and skills.” (SP13)*

*“By integrating ICT in teaching, the role of a lecturer is changing, because in the past the lecturer used only chalk and blackboard...writing everything...but nowadays by integrating the ICT the role is changing...the teacher can decide to organize the students so that themselves can do self-directed learning without the presence of the teacher...and facilitated by that technology, the student will learn more easily.” (TP19)*

### **Bridging the gap of the digital divide**

**Political commitment:** From document analysis, it was found that government in Rwanda is aware of the digital divide in ICT and internet access, and is trying to bridge the divide. In this regard, the findings reveal that Rwanda has made an enormous progress in ICT, guided by its Vision 2020. In keeping with the Vision 2020 focus on transforming Rwanda to a knowledge economy, government initiated the National Fibre Backbone project in 2008 to provide connectivity and adequate broadband communication services across the country. A related ICT-focussed government project is E-Rwanda, and government has also been encouraging traditional media to bridge the knowledge divide and facilitate the flow of cultural content,

particularly in rural areas. Recently Microsoft unveiled Windows 8 in Kinyarwanda. In the health sector, there is E-Health, dealing with the application of ICT to promote quality of care through services such as the Rwanda Health Management Information System (R-HMIS), TracPlus and TRACnet, and Telemedicine. In the education sector, there is the integration of ICT in teaching and learning. In 2015 there were five centres for e-learning, with a total of 614 nursing and midwifery students, successfully using videoconferencing to upgrade nurses from A2 (A-level) to A1 (Advanced Diploma) (Republic of Rwanda, 2015a). In the digitalisation of the country, the government introduced innovations in education rarely seen in the region, such ICT buses, telecentres, public information kiosks, the National ICT Literacy and Awareness Campaign initiative, a digital public library, and archive services. In this study, some nursing students noted that students enrolled in e-learning programmes are able to use ICT, and others added that they are participating in the Vision to use ICT.

*“Over 3,000km of Fibre Optic cables were laid across the country connecting all the 30 districts and 11 border posts...Many sites across the nation are connected including secondary schools, universities, hospitals, district offices, judicial courts and most of the central government institutions.”*  
(Republic of Rwanda, 2015a: 38)

Document analysis indicated a targeted extension of electrification to the rural areas and increase in overall electricity supply with the hope of eliminating problems of power disruption that cut off internet access and retard computer literacy. The electrification target is for electricity supply to 100% of schools, 100% of health facilities and 100% of public sector offices by 2017, either through connection to the grid or through reliable off-grid systems:

*“The Rwandan Vision 2020 target to increase the energy and to achieve this, Rwanda has considerable hydroelectric potential, in addition to large deposits of renewable methane gas in Lake Kivu, estimated at 60 billion cubic meters.”* (Republic of Rwanda, 2012c)

*“The new target would also include electricity supply by 2017 to 100% of schools, 100% of health facilities and 100% of public sector offices either through connection to the grid or through reliable off-grid systems. With these targets, the peak demand and electricity consumption are forecast to grow at about 12.0% and 11.6% p.a. respectively from 2010 to 2020.”*  
(African Development Bank Group, 2013: 32)

**Early socialisation to IT:** In this study, it surfaced that Rwanda has made a huge progress in socialising Rwandans in the use of IT. Emerging data indicate that government seeks to transform Rwanda into an ICT-literate nation, reaching 50% computer literacy for the

population aged 15 and above by 2018, and raising awareness and use of existing and future ICT-enabled information and services for at least 60% of the Rwandan population aged 15 and above by 2018. A related project is to supply one laptop per child in primary school; in this regard, the One Laptop Per Child program (OLPC) was launched in June 2008, and the currently proposed target is to provide all students from P4 to P6 with access to laptops, The OLPC project was set to receive 100,000 more laptops in a bid to ensure that all 416 administrative sectors in the country have an OLPC-enabled school, and the project has seen about 80,000 laptops distributed in 145 schools countrywide (Kanyesigye, 2012). To cut the cost of books and other printed materials, government is also considering digitisation of learning materials through its Smart Classroom (Mark, 2015). According to the Education Ministry, the Smart Classroom initiative will also ensure that students across the country can easily access same learning materials. Director General in charge of the Education Board, John Rutayisire, says this is Rwanda's long-term ICT plan, in which the 'Smart Classroom' will help the country do away with the burden of book costs, as Rwanda presently spends Rwf6bn (\$8.6m) on books yearly (Mark, 2015). Recently one laptop per students has been initiated in tertiary education by the University of Rwanda at Huye campus, and it is expected to expand to others campuses in the Smart Rwanda programme (Tuyishimire, 2016). A lot of progress has been made in mobile and Internet banking, and many of the local newspapers can also be found on the internet. It emerged from the document analysis that with a big number of people speaking Kinyarwanda, the introduction of Windows 8 in Kinyarwanda will assist in building information and communication technology literacy in the country, spreading ICT usage to a large proportion of the population (Republic of Rwanda, 2015a: 32). Emerging data indicate that there is a focus on increasing ICT literacy and awareness and this is done through capacity building, ICT buses (Mobile telecentres), digital public Kiosk, National ICT literacy and awareness campaign.

*“ICT buses are mobile telecentres as well as computer labs, more convenient and affordable for farmers, traders, students, women, youth groups, entrepreneurs and other rural based Rwandans to access ICT services as well as training. Four buses are crossing the countryside to take the computing and Internet services to remote and underserved areas.”*  
(Republic of Rwanda, 2015a: 17)

*“Rwanda Development Board (RDB) has installed digital public information kiosks normally composed of touch screens and printers that are connected to the Internet to help service seekers check the information they need.”*  
(Republic of Rwanda, 2015a: 18)

*“Public Information Kiosks, National ICT Literacy and Awareness Campaign Initiative aims at transforming Rwanda into an ICT-literate nation and reach a 50% computer literacy by 2018 for the population aged 15 and above and raising the awareness and increase the use/consumption of existing and future information and services enabled through ICT...The campaign is on-going.”* (Republic of Rwanda, 2015a: 19)

**Emotionally mature students:** Data emerging from this study indicated that the main reason for the introduction by the Rwandan government, under the umbrella of the Ministry of Health and its partners, of e-learning in nursing education, was to upgrade nurses who had originally been trained in a content-based curriculum from diploma level (A2) to advanced diploma level (A1). All of these nurses had been working in various health settings across the country, with an overall age range from 28 years to 50 years and average age of 36 years. Teaching mature students required a different approach that is student-centred, involving self-directed learning, collaborative learning, inquiry-based learning, interactive learning, and integration between theory and practice. Emerging data show that a blended learning approach was adopted, with 60% being self-directed via online learning management (Moodle), and 40% being face-to-face. It emerged that those who were enrolled in that e-learning found it interesting because it helped them to become familiar with ICT and English language, and they continued to work, supporting their families while accessing the teaching and learning resources either in their respective places of work or in their homes. The comments below show this:

*“IT is a special program where both students and lecturers have to be hard working, from both side, because during the time of face to face, not just the lecturer prepared the content to deliver to the students but also they participate through assignment, through group works...they are having a background a background in nursing sciences from A2, I would call it diploma...we just first take what they have as a standard.”* (TP6)

*“...when we use these technologies, it helps us to get information on time...and also it helps us to practice what is learnt from those technologies...it is better for us to learn this program because we are learning and we are working....”* (SP11)

#### 4.8.7.2 Inhibiting conditions

In this study, it surfaced that before even considering any e-learning solutions or tools, it is imperative to assess and address the conditions that can cause failure in education. Success in online learning comes about by understanding the needs as well as the readiness of major players in the online learning environment. By understanding these critical conditions that

foster online learning, success in implementing an online-learning-ready environment is more likely to be achieved. Although the e-learning was positively perceived by participants, a number of obstacles to the use of e-learning were reported, and the following categories emerged from findings: (a) Resource constraints; (b) Insufficient ICT literacy (computer/ Internet/ Moodle); (c) Challenges with the language of instruction; (d) Generational age gap (e) Lack of policies regarding e-learning; (f) Resistance to change; (g) Issues of interface design of Moodle.

### **Resource constraints**

It emerged from the participants that resource constraints were hindrances to the utilisation of e-learning. Constraints reported by participants were: insufficient infrastructure, shortage of staff, work overload/time constraint, poor motivation, financial problems, inaccessibility of Internet/website/Moodle. It emerged from data sources that there was insufficient infrastructure to accommodate regular and large numbers of e-learning students; problems cited were: classrooms, poor libraries without sufficient online books, no expansions of the buildings such as ICT lab and skills laboratory, and no computer for all students. From the field notes of the researcher, it was observed as well that at most campuses where the study was conducted there was no expansion of classrooms, library or ICT laboratory and skills laboratory.

Adequate infrastructure is associated with the success of e-learning. In this study, participants indicated that lack of infrastructure had been a major problem in the implementation of e-learning. This mirrors some of the general infrastructure problems in education, with adequate classroom and electricity likely to take precedence over ICT implementation when it comes to basic necessities for institutions. It also emerged that inadequate physical and knowledge infrastructure base was exacerbated by poor computer, telecommunications and internet facilities. Substantial effort should be put into infrastructure. The comments below reflected this:

*“The equipment for video conferencing is not sufficient, there is no sound proof, and the same only computer lab is used for video conferences...the schools have insufficient classrooms to hold all the students...poor library and no sufficient of online books and journals.” (TP20)*

*“...normally per class, let me talk about the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> intake of e-learning...we used to have more than 60 students...while our classrooms are very small rooms... and that is another challenge.” (TP19)*

In this study, data from the participants indicated that shortage of staff was associated with excessive workload and had a huge impact on teachers' motivation and morale. In this study, work overload was reported not only by teachers, but also by students and ICT managers. They reported that students had to work and study, and combining both was not easy because online facilitation was done during the evening or night, and nurse educators felt overloaded with work, without time to care for their families or even prepare their next teaching sessions. Data sources revealed that there was constant pressure from increasing internationalisation and globalisation in the university sector, from fluctuations in student populations, and from the rise of technology. In addition to issues with improving teaching and learning, academics and administrators alike have to manage many competing agendas: the push for more research, better quality research, and collaborative research; accessing other sources of funding (extra jobs as source of income); an increasing administrative load; larger classes, and multiple sessional tutors. The data from this study indicated that when workload pressures increased, attention to quality teaching and student interaction was the first casualty. The comments below reflect this:

*“The teacher is supposed to have the time during the night to discuss with the students, because by the day they are working and they are free by the night...and the teacher will be working the whole day and meeting the students the whole night.” (TP6)*

*“... the challenges for me it will be difficult to complete the course...because we study in a little time and many courses...we are overloaded and we have quite a lot of work.” (SP10)*

*“...the time is short...and in that short time we have to complete a lot of things...that was a challenge.” (SP17)*

The findings from this study indicated that to perform well in their teaching activities teachers need to be motivated. There are many factors that could affect their motivation: the nature of the school infrastructure; salary; recognition/professional status; achievement; advancement/further training; relations with others; school leadership and policies; working conditions; recruitment; deployment; and many others. With regard to e-learning, the real progress in using technologies to enhance the learning experience and learning outcomes will result from improvement in the quality of technology and support, and from motivation of teaching faculty to use them. Teaching institutions should be committed to full integration of e-learning in their instructional mixes, and need to move beyond small grant programs that surface and reward early adopters. Study participants reported that there was no motivation for teachers despite excessive workload, extra working hours, and teaching bigger numbers of e-

learning and regular students. The campus managers who participated in this study also reported that there were no incentives for using ICT in teaching and learning, and one of them said that it was due to budget issues. Emerging from the data, it was expressed that teachers' working conditions and environment, if not supportive, reduce their motivation and commitment to teach. If teachers have low levels of job satisfaction and are poorly motivated, students are not well taught and thus don't receive minimal acceptable education. The comments below reflected this:

*"There is no motivation, and you have to combine both, and before the e-learning came, we had the same salary...and when the e-learning came, the salary remained the same, but the work has increased...maybe they have money and may try to motivate those night hours."* (TP6)

*"...no motivation for lecturers who consider e-learning as an added task to their job and no motivation for IT for their support, considering that they work every time [Night and Week end]."* (TP20)

*"...motivation was not there...teachers were not motivated...the reason why even the use of Moodle platform...was decreasing slowly and slowly because of lack of motivation."* (TP19)

Institutions organize their central e-learning resources in various ways. The findings from this study indicated that although using e-learning reduces costs and achieves staffing cost-cutting, institutions need to have a mixture of staff to contribute both technical and pedagogical knowledge and expertise. In data emerging from this study short staffing was also reported as a serious challenge to implementation of e-learning. This short staffing led to work overload as already mentioned. The number of teachers employed before the introduction of e-learning did not increase, and those who were assigned to teaching e-learning found themselves also teaching regular students. Need for an adequate number of trained staff was reported as imperative. The data revealed three areas of particular importance for e-learning infrastructure: course management systems, well-equipped classrooms and computer labs, and computer access for students and teachers. The findings of this study indicated that at one of the campuses where the study was conducted the ICT manager was not available and the ICT room was closed for almost two months (from research field note). This meant that teachers and students did not have access to the computers, most of which were in the ICT lab. It was observed at other campuses that nurse educators had to share the computer laboratory, and this was judged by nurse educators as not adequate as there was a risk that students might accidentally access teachers' personal information or academic material such as tests, assignments and quizzes. It also emerged that students' computer labs are an extremely important component of e-learning

programs. Rising e-learning course enrolment pushes student demand for computer access, resulting in overcrowded computer labs because current facilities are too small and too few in number. The comments presented below reflected the unavailability of the computer lab:

*“It is a long time that this computer lab is closed...even the students and teachers we don’t have an access to it. For two months now we don’t have an access to it.” (TP12)*

*“...yes of course...we face these challenges...before we had ICT managers who helped us to adjust these technology problems...but now days we don’t have them.” (TP14)*

*“I think we should have enough staff, trained staff who are ready to teach online.” (TP16)*

Data from this study indicated that a basic requirement for online e-learning is access to a stable internet connection and dependable computer. For online learners and teachers, their computer and internet access are the primary instruments of learning and teaching. It surfaced from this study that lack of Internet network and access to Moodle were problems for a number of participants, which led to poor facilitation and inability to do online activities as required. It emerged that at a certain point Moodle was out of action for a year due to various problems and had to be relocated, where it is currently stable and working well – although Internet access problems and electricity disruptions still create difficulties for participants using the Moodle platform. In addition, many teachers are not trained in how to incorporating e-learning into their teaching methods, and learners do not have the appropriate access to the internet outside educational institutions to make e-learning practicable at this stage. The comments presented below show this:

*“...network has been a challenge...when using Moodle, and we were at work...sometimes the network failed...to meet the facilitator was a challenge...and to do some quizzes on Moodle platform it was a problem.” (SP8)*

*“Moodle started in 2012, but later it had quite a lot challenges. It was down most of the time and Moodle hasn’t been working for 1 year in 2014... that is why it (Moodle) had to be relocated from Ministry of Health to USA, at Tulane University...and of course there is the problem of the electricity.” (FGD-P2)*

*“The breakdown of Moodle: frequently Moodle breaks down, due to the facts that electricity in some schools is sporadic, and times this limits the number of users, some schools don’t have generators which is a problem for video conferencing, online exams and courses.” (TP20)*

Revealed from the data, participants indicated how academics are placed in relation to pastoral wellbeing of their students. University students are adults and the duty of care that academics have is often perceived as more informational than hands-on. Students often face an uncomfortable transition from supporting themselves to being a student. For many students it has been crucial in making the training possible. Data sources revealed that nursing is a careers that has not only experienced extreme growth in terms of demand, but has also reached a point of crisis in some locations due to shortage of qualified individuals to fulfil the needs of the community. These extremes create a strong need for provision of financial assistance by government entities to encourage more people to seek careers as nurses. The findings revealed that in recent years lack of funds to support the students has been reported as a hindrance to e-learners. It emerged from data sources that initially they were funded but later the funds stopped. Although nursing students were working, some participants reported that they had been promised some funding during their clinical placements. This was because they had family care responsibilities and other their needs as adult learners. The following comments reflect this:

*“The students of 2013 intake are not sponsored, it difficult for them to achieve all needs.” (TP20)*

*“School fees from the Ministry of Health... are there, but we don't get nothing to help us in our practical settings...no money...the life is very difficult... but when the program started, it was said that if we are in our clinical practice...they must give a small amount of money...to help us to survive.” (SP13)*

### **Inadequate ICT literacy: Computer/ Internet/ Moodle**

Data sources from this study indicated that e-learning requires more than just access; the student's teachers and the administrative and technical support staff for the e-learning environment must also have the necessary technology skills to make them ready to venture into e-learning. This involves basic computer skills, online skills and computer application literacy. Success in an e-learning world demands new forms of literacy and expertise of students. Data emerging from this study revealed that some of the inhibiting conditions to e-learning may be regarded as digital divide; these relate to **insufficient training of students and teachers** in using computers, Internet, and Moodle for teaching and learning in e-learning platform, frustration of teachers and students in the use of these technologies, and difficulties in accessing academic-related materials. Data from this study indicated that inadequate ICT literacy led to inadequate online facilitation of the students by teachers, and to both teachers and students

being unable to derive maximum benefit from e-learning. It was reported that nurse educators must possess the unique set of tools, skills and personal attributes required to perform online teaching and online environment administration successfully. Teaching in an online course involves more than replicating classroom strategies in a different form. It requires a different approach that focuses less on the amount of time students spend together in a particular place, and more on facilitating a distance community and on activities designed for students working individually. For the future success of e-learning both nursing students and nurse educators must be sufficiently skilled in ICT, as insufficient ICT literacy has been reported at all three campuses. The comments below reflected this:

*“There is computer literacy among students...and on how to engage an online discussion...There is also lack of training among nurse educators and students on the use Moodle.” (FGD-P2)*

*“First of all this system of e-learning, using Moodle, because we have not been trained in using Moodle, it was difficult for us to use it that was a frustration and a challenge...” (TP11)*

*“...a few numbers of trainings for lecturers about Moodle and the preparation of online course [Engaged and motivated online courses].” (TP20)*

*“Student don’t like Moodle because they don’t have sufficient knowledge on the use of Moodle... and most of the time they are confused about different programs on Moodle and they find much difficulty in retrieving some information, even doing some exams or some work from Moodle it is very difficult for them...and it is a challenge for them.” (TP1)*

Providing adequate support for e-learning activities is a complex proposition. Producing and teaching an e-learning course effectively entails a web of many resources. Each strand must be sound to ensure that the course succeeds. For example, a technology-mediated course will not succeed if it is hampered by inadequate network bandwidth or a lack of instructor or student proficiency in course management software. Areas like IT or faculty resource centres help maintain this resource web. In this study, it emerged that challenges in the use of ICT tools by students caused frustration among nurse educators, with some of them teaching only face-to-face for courses that were supposed to be taught in a blended mode. Nursing student participants reported that more time was needed for learning to use computers and the Internet, and nurse educators, from their side, felt that students at the selected school didn’t have enough Moodle packages. From various data it was noted that an individual learner's success in an online course often hinges on his readiness. Prior to implementing any e-learning initiative, the institution must take into careful consideration the readiness of students. Readiness is fortified

by ability to work independently, self-motivation, mature reading and writing skills, and a proactive approach to learning, as well as a positive attitude about the learning experience in general.

*“...they are there for some students who don’t know to use them (computer and Internet) well...it has taken a small time to emphasise on them...and somebody arranges himself to increase and to learn the knowledge in terms of using computers...and no computers for all students.” (SP13)*

*“...but today the only thing that is frustrating is when you want to teach people...and you are supposed to teach them in e-learning system...and those you are supposed to teach... they are not familiar with it...That frustrates a lot...you are supposed to go to teach your course and to teach ICT and that is a big challenge.” (TP2)*

### **Challenges with language of Instruction**

**Historical context of Language of Instruction:** Data emerging from this study indicated that English as the language of instruction or academic language was a challenge for those enrolled in the e-learning system. From document analysis, it was found that problems in using English have their roots in the colonial area. It was found that Rwanda was colonised by Germany and later Belgium. The language of instruction used during Belgian colonisation was French. Throughout the 1960s, the extremist government launched vicious attacks on Rwanda’s Tutsi population, resulting in a mass exodus into neighbouring Burundi, Tanzania, Uganda, Kenya and Congo (Republic of Rwanda, 2008b). Exiles in other countries who had a chance to study were required to do so in various different languages; for example those who fled to Anglophone countries found themselves studying in English and those who fled to Francophone countries found themselves studying in French. Within the country, during the First Republic and the Second Republic there were two official languages, Kinyarwanda and French, and French continued to be the language of instruction in tertiary education. Data sources revealed that English was introduced as an official language after the 1994 genocide against the Tutsi, becoming the third official language along with Kinyarwanda (mother tongue) and French. In recent years Rwanda’s language policies dropped French and installed English as the only language of instruction (Samuelson and Freedman, 2010).

### **Unpreparedness to use English as a language of instruction for mature-entry students:**

The findings from the current study indicated that the use of English as a language of instruction was a challenge for mature-entry nursing students, language of instruction (LOI) being the language in which subject matter is taught in a public or private school setting. The historical

context is that Rwanda has moved from French as LOI to English as LOI, making Rwanda a significant example of shifting English language policy on the African continent. English became an official language after the 1994 genocide, but more extensive language policy changes occurred in 2008 when the government created plans to make English an official language of instruction in Rwanda's public schools, replacing French as the dominant second language taught. It emerged from the participants that mature-entry students, in particular those who had been trained in a francophone system, faced challenges in using English as the language of instruction, especially at the beginning of their advanced diploma program. Some of the participants indicated that they sometimes use Kinyarwanda or French for a fuller understanding. This was also observed in interactions of the nursing students with the researcher during the interviews. One of the participants commented that nurse educators could allow more time for asking questions or mix languages such as using both French and English.

The data sources indicated that the role of Kinyarwanda, as a mother tongue, in supporting English as LOI could not be ignored, in particular during group work and clinical accompaniment by nurse educators and clinical mentors. A common language among learners has a potentially important mediating role to play in facilitating learning and in supporting collaboration in learning. Evidence from the group discussions and the interview data showed that Kinyarwanda was almost exclusively used in supportive peer groups and even in formal classroom lectures to clarify concepts and clear up confusion. Failure to explain in Kinyarwanda (for example, with some expatriate lecturers who do not know Kinyarwanda) resulted in less understanding of the subject matter during lecture time and required extra practice and mentorship sessions where students would repeat the same course among themselves in Kinyarwanda during their private study time. The comments presented below reflect the issues around English as a language of instruction:

*“The problem of English language is a very big challenge...the programme is elaborated in English, it was very difficult to adapt ourselves” (SP13)*

*“...we have the language problem. Because the academic language is English but many of them, when you are teaching, they want you to explain in another language...maybe in French or Kinyarwanda...for more understanding...they are some students who don't have sufficient knowledge, or understanding the English.” (TP9)*

## **Generational age of nursing students: “digital natives and digital immigrants”**

Data sources indicated that age of nursing students is a key important aspect to consider when implementing e-learning. The new generation is born into the world of technology (digital natives). However, people who were not born into the digital world (digital immigrants) face changes related to computer literacy. It emerged from this study that a significant number is above 36 years old, and in this study they are referred to as old generation. It emerged from this study that the aged ones (digital immigrants) face more challenges than the younger ones (digital natives), what some participants called new generations. Those challenges are observed in terms of using e-learning and particularly the ability to use computer and Internet. Some of the participants in the mid-forty age group said they view computers and WhatsApp to be for the younger ones. Some nurse educators also reported having difficulty in online facilitation of the mature students, due either to their computer literacy or to other responsibilities they may have at home which make them unavailable when needed for online interaction. The native/immigrant analogy can help us understand the differences between those who are comfortable with technology and those who are not. It is argued that teachers need to learn the language of the natives in order to speed up instruction and to provide random access while integrating the digital immigrants. Participants from this study indicated that teachers can learn much from looking at the digital natives and immigrants as diverging cultures, but they need not take the analogy too far. Education does need to adapt and evolve with the times, and teachers need to understand the learning styles of their students, but they do not have to assume that their students are incapable of learning from or communicating with the digital immigrants even if they suspect that their thought patterns are different from their own. The following comments show some of the responses from the participants:

*“...so in terms of using Internet from the new generation...they are able to use all the online resources but for the old generation it is very difficult and not very easy ...because sometimes they want to reach the Moodle platform...and they forget their password...but for the new generation they don't have these problems...and sometimes for the older generation I prefer to give them the password and I write it on my paper...and when they forget I try to give back the password.” (TP7)*

*“...the e-learning students...they have no sufficient strive for working. Sometimes if I compare with the age, and the students who are in e-learning they have the advanced age than the residential. For the old generation it is very difficult to catch the course.” (TP9)*

*“...you may indicate to the students about these resources but they don’t have knowledge about that, they don’t know how to go and look for information from online.” (TP17)*

### **Lack of policies regarding the e-learning in nursing school**

Policies are needed to provide a framework for the development of e-learning, and the absence of such policies is a clear obstacle to the development of e-learning. In this study, it emerged that there is no specific policy regarding e-learning in nursing schools, no policies on plagiarism and copyright or on how e-learning should be managed. Participants interviewed reported that the only policy they know is to teach 40% of the module face to face and another 60% in form of self-directed learning when students are at their workplace. Some other participants reported that they have two weeks face to face and another two weeks when they return to their workplaces in which they may continue to communicate with their lecturers. Data from this study showed that there is a need for cross-disciplinary standards for e-learning and belief in the importance of providing faculty who teach online with general guidelines and best practice information. The comments presented below show this:

*“...now we don’t have a policy regarding the plagiarism, nor having some software to detect plagiarism, this reduces the critical thinking of the students..., I think we can use these kind of software to reduce this plagiarism rate, so that our students could work for themselves...” (TP19)*

*“We are in the process of developing an online teaching and learning policy. So, there has not been any. You [referring to researcher] may need to look at the HEC distance learning policy, it may not necessarily apply though.” (Director of CTLE)*

*“...ah...not much [referring to policies] in terms of using e-learning and Moodle.” (FGD-P2)*

### **Resistance to change**

The findings from this study indicated that fear to adopt new technologies, poor attitude towards e-learning, age group and perception that e-learning is additional workload, caused resistance to effective implementation of e-learning. It emerged from this study that some of the participants preferred teaching students face to face rather than using Moodle. Data further revealed lack of facilitation of students online, and lack of motivation to use Moodle. The following comments from the transcripts provide more explanation on why, for various reasons, some teachers don’t want to change from traditional methods to innovative methods. Reasons given by the participants on why they prefer face to face rather than using e-learning

platform may be grouped as follows: the teacher can see the reactions of the students, be aware when students don't understand and give further explanation; most of the time the Moodle platform is down; teachers try to give to students 80% or even 100% when they are here for two weeks face to face; students complain there is no Internet network or electricity in the countryside; teachers don't want to change their mind after Moodle was down for a year and they are used to face-to-face teaching; e-learning for the students is very difficult; it is difficult to get the time to collaborate with students when they are in their workplace; teachers think that the e-learning program level of perception is lower than that of the residential (full-time) students; it is difficult to use Moodle, not having been trained; they use face to face because they are not informed about using Moodle, and that is why they don't use Moodle. Also apparent was lack of motivation for teaching in e-learning because it is regarded as an extra task. In this study, it surfaced that decisions about the use of technology were influenced by an ideological gap between the change in approach in higher education and the reality of what students and educators see as a responsibility to prepare themselves to provide safe patient care. This is particularly the case because of the way e-learning has been tailored and promoted as a tool to facilitate self-directed and autonomous learning. A number of nurse academics chose to continue teaching in a traditional didactic approach to appease the students. The following participant comments reflect this:

*"I can say I have never really facilitated students online, because we used to take the advantages of their face to face sessions, we try to cover everything... Network, most of the time the wireless connection is down, and sometimes the electricity, another thing is that you may indicate to the students about these resources but they don't have knowledge about that, they don't know how to go and look for information from online." (TP17)*

*"...when this Moodle from MoH stopped, all the persons set in their mind...that they have to teach face to face...now this Tulane University is introduced...people are now used to the other method of teaching...so I tell you if there are 10 people who teach e-learning program...maybe one is using this[Moodle]... when I was engaged, I had to teach e-learning but I didn't teach e-learning...I teach face to face...this Moodle platform is down and then this Internet network which is also down." (TP8)*

*"...No motivation for lecturers who consider e-learning as an added task to their job, no motivation for their support, considering that they work every time [Night and Week end], Needs for IT and lecturers of laptops and charged modems to facilitate the support and the follow-up of students." (TP20)*

## **Issues with Moodle interface design**

Various sources indicated that within Moodle there are many software interfaces, such as the interface a module uses to communicate with the core product, or the interface used to send mail. It emerged from the data collected on Moodle from three campuses where this study was conducted that there needs to be better organisation of modules on Moodle. It is quite difficult to know at which level a given module is taught, and the semester and even the weeks in which various units were covered. Moodle analysis from the three campuses indicated that there was no incorporation of Turnitin in Moodle (so that it was not possible to check for plagiarism), there were no ethical guidelines on how Moodle should be used for academic purposes, and there is no Moodle user guide document. From further analysis, it was found that the quality of forum discussion and chat was low. Log reports indicate overall a poor participation of students and teachers; some students have never logged in, and some teachers, co-teachers, and campuses managers don't follow what teachers and students are posting online. Another observation about Moodle platform is that the majority of students from the three campuses who use it open it to see what has been posted and very few use it to interact with their teachers. Problems were also noted with Moodle integration of the Adobe Captivate and Big Blue Button software applications (From researcher's memos on Moodle Analysis: due to ethical issues the screen capture is not presented). It emerged from various data sources that a very important requirement for interfaces is standardisation, which reduces the amount of learning that users need to do to explore the features in the software. Moodle has had informal standards in the past, and a more formal written specification is necessary to help Moodle's many developers produce a more consistent interface and remove some of the irregular, inefficient or hard-to-learn interfaces that have crept into various corners of Moodle.

### **4.8.8 Consequences**

According to Strauss and Corbin (1990), consequences represent the expected and unintended outcomes resulting from actions and interaction.

#### **4.8.8.1 Intended outcomes**

In this study intended outcomes were put into the following sub-categories: (a) Nursing and midwifery education, (b) Health system, (c) Nursing practice.

#### 4.8.8.2 Nursing and midwifery education

In this subcategory, it is expected that the outcome of the effective use of e-learning by nursing students and teachers in nursing and midwifery education would be the production of competent nurses and midwives who are capable of responding to health-related issues of the community. For patient care quality, nursing competencies are vital. In the education of health care professionals, e-learning has been considered as an important tool to develop the skills need to complex clinical situations. Expected outcomes of using e-learning may be listed as follows:

(i) Enhanced quality of education: It is expected that the quality of education will increase through the effective use of an e-learning platform, since e-learning promotes student-centred approaches where students are self-directed, learn collaboratively, do research and which in return promote inquiry-based learning. This enables students and nurse educators to be familiar with technology such as computers, the Internet, learning management systems and ICT in general, and to be able to access updated information anytime and anywhere, which will help them to provide evidence-based practice when they graduate.

(ii) It is expected that students and teachers will acquire professional and personal development and growth from student-centred approaches such as adult learning, self-directed learning, active learning, critical thinking and collaboration.

(iii) There will be the integration of theory and practice that will promote evidence-based practice.

(iv) There will be responsiveness to national policies and laws: document analysis and interviews indicated that the use of e-learning in nursing and midwifery education was responsive to the Rwandan Vision 2020 and to statutory provisions such as the law establishing the nursing council; the law establishing the scope of practice for nurses and midwives, the law establishing higher education and the law establishing the University of Rwanda, all of which call for a change in the preparation of health professional so that they are able to meet the needs of society.

#### 4.8.8.3 Health system

In health systems, putting evidence into practice can be very problematic when there is an insufficient number of competent health care professionals. Using e-learning as a medium of

instruction is expected to increase the nursing and midwifery workforce in a short space of time and in a resource-constrained context. This will bridge the gap in the qualified nursing and midwifery workforce in various clinical settings. Looking at the big number of competent graduates expected to graduate each year, it is expected that there will be an improved quality of healthcare services at all levels. The health system is becoming more and more digitalised (as with the reference to E-Health previously in the chapter) and new graduates are expected to be skilful enough to use the new technologies in the Rwandan health system and beyond.

#### 4.8.8.4 Nursing Practice

Information technology is being adopted progressively among health care providers. ICT provides opportunities to share information in remote settings and the low-resource environment. Nurses and midwives use technology to access information to use in their daily activities and as a way of upgrading their academic levels. Although working and studying in a clinical environment is challenging, healthcare workers in the context of Rwanda are increasingly using technology in the clinical setting for record keeping and communication. For busy practitioners, e-learning could be used for mandatory updating and to ensure that practices are kept up to date. It is expected that e-learning will help to correct bad nursing practice routines by integrating newly acquired knowledge into nursing practice, thus improving the services provided to the clients in various clinical settings. It is expected that students and teachers during their clinical placement will make a huge impact on the quality of nursing care and services are provided to the patients guided by E-Health in Rwanda.

#### 4.8.8.5 Unintended Outcomes

The sub-categories that emerged from this study were (i) collaboration and partnership, (ii) transferable learning experiences.

#### 4.8.8.6 Collaboration and partnership development

Collaboration emerged as an important outcome in the process of analysing the utilisation of e-learning platform and the development of a middle-range theory to guide its facilitation. This collaboration partnership with various stakeholders in these phases of the study provided necessary information that was required for the study and contributed in facilitating training in the use of Moodle for future sustainability. It emerged from the findings that the partnership between the selected nursing and midwifery school and other higher teaching and learning

institutions, the Ministry of Health, Rwanda HRH, the Ministry of Education and the National Council for Nurses and Midwives was vital in the implementation of e-learning in terms of providing all necessary requirements for improving its success. Document analysis indicated that through the Rwanda HRH program faculty from the United States teaching institutions (USF) "twin" with Rwandan faculty (RF) to transfer skills. This type of collaboration and partnership is vital for the future sustainability of e-learning.

#### 4.8.8.7 Transferable learning experiences

Data sources from this study indicated that transferable skills go beyond what is learnt in a formal context. Everything one does, has the potential to help one's acquisition and development of transferable skill. It is expected that students and teachers will acquire transferable skills in using science technology, and in particular the e-learning platform, and will display critical responsibility towards nursing and midwifery education and the health environment. It is expected that all stakeholders will collaboratively work in teams and will strive to achieve skills in computer use, social networking, communication, information gathering, research and customer care. It is expected that nurse educators and nursing students reap the benefit of transferable learning experience from the training and the sharing of experiences through the twinning of the selected school with USA faculty through Rwanda HRH.

## 4.9 SUMMARY OF MAIN QUALITATIVE FINDINGS

The summary of the main findings of this study focuses on the categories and sub-categories which emerged from this study. The formulation of these categories was influenced by Strauss and Corbin's framework (1990).

**First:** E-learning in nursing and midwifery education was conceptualised according to the following categories: (a) a mechanism to advance political agenda, (b) a tool to open access to education for working nurses and midwives, (c) a student-centred approach, (d) blended learning (face-to-face and online via Moodle).

**Second:** The antecedent or causal conditions were: (a) reforms in nursing education, (b) inadequately prepared graduates, (c) insufficient number of graduates, (d) need to upgrade larger numbers of graduates from the level of A2 nurses to A1, (e) nature of the graduate produced after engaging in the new curriculum.

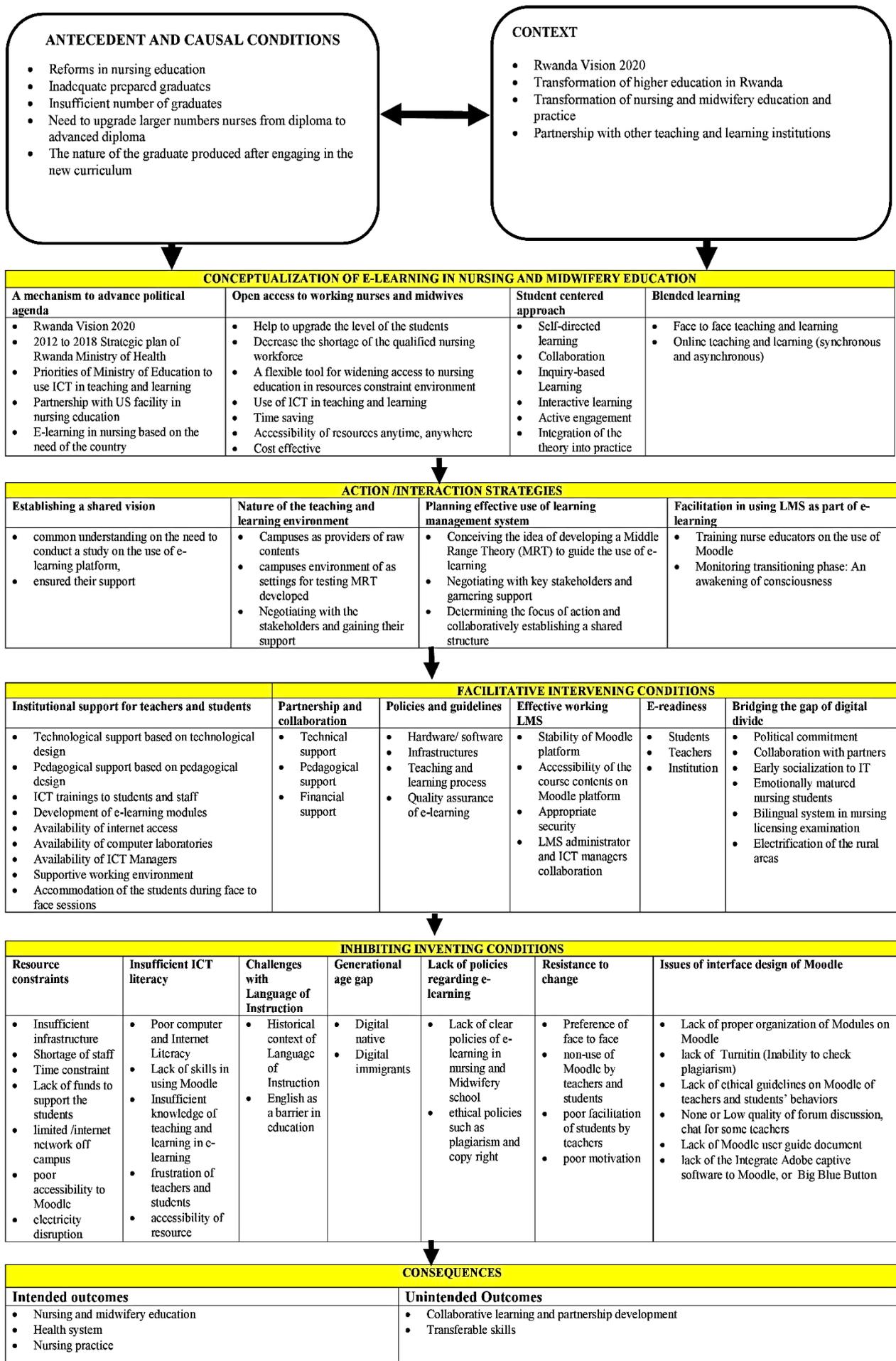
**Third:** The context was described and the following categories emerged: (a) Rwanda Vision 2020, (b) transformation of higher education in Rwanda, (c) transformation of nursing and midwifery education, (d) partnership with other higher institutions of teaching and learning (USA Universities through HRH program) to upgrade nursing and midwifery education.

**Fourth:** Action/Interaction strategies for the successful use of e-learning platform included: (a) establishing a shared vision, (b) nature of the teaching and learning environment (campuses as providers of raw contents, campuses environment as a setting for testing a middle-range theory developed), (c) planning effective use of learning management system, (d) facilitation in using LMS as part of e-learning.

**Fifth:** Intervening conditions were subdivided into two domains: facilitative intervening conditions, and inhibiting intervention conditions. *Categories which emerged as facilitative intervening conditions:* (a) institutional support, (b) partnership and collaboration, (c) policies and guidelines, (d) functionally effective of learning management system (Moodle), (e) e-readiness, (f) bridging the digital divide. *Categories which emerged as inhibiting intervening condition:* (a) resource constraints, (b) insufficient ICT literacy (computer/ Internet/ Moodle), (c) challenges with the language of instruction, (d) generational age of nursing students, (e) lack of policies regarding e-learning, (f) resistance to change, (g) issues of Moodle interface design.

**Sixth:** Consequences or outcomes emerged and were subdivided into two: Intended outcome and unintended outcomes. *Intended outcomes:* (a) nursing and midwifery education, (b) health system, (c) nursing practice. *Unintended outcomes:* (a) collaboration and partnership development, (b) transferable learning experiences.

Figure 4-39 gives a schematic presentation of the main findings



**Figure 4-39: Schematic presentation of axial coding**

## **CHAPTER 5**

### **DISCUSSION OF THE FINDINGS**

#### **5.1 INTRODUCTION**

To reiterate, the aim of this study was to analyse the utilisation of the e-learning platform at selected nursing school campuses in Rwanda and develop a middle-range theory on the utilisation of the e-learning platform at selected nursing school campuses in Rwanda. The objectives of this study were: (i) To analyse the processes and procedures involved in the utilisation of the e-learning platform in selected nursing school; (ii) To explore the perceptions of the users of the e-learning platform in the selected nursing school; (iii) To explore the support provided to the users of the e-learning platform in the selected nursing school; (iv) To describe the intervening conditions in the utilisation of the e-learning platform.

For the purpose of this study, mixed methods were used, following Creswell (2003), for various purposes including corroboration of findings, reducing cultural investigators biases, addressing participant experiences, demonstrating credibility, increasing generalizability, and informing professional practice and/or public policy. In this chapter, the quantitative findings, in particular the correlation to determine the relationship between different variables, are integrated with the qualitative data which have been presented according to Strauss and Corbin's grounded theory framework, and the discussion of the results is done using literature to make theoretical referents. The purpose of this study was to analyse the utilisation of e-learning in the selected nursing school, and accordingly develop a middle-range theory that would be used as a guide or a framework to improve utilisation of the e-learning platform in Rwanda. According to Denzin and Lincoln (2013), researchers have identified grounded theory as a useful qualitative method to adopt in mixed methods research. Mixed methods in grounded theory take into account triangulations of the findings (Denzin and Lincoln, 2013).

#### **5.2 SOCIODEMOGRAPHIC FACTORS**

The qualitative and quantitative findings of this study indicated that the majority of the participants were female. This is not surprising, as nursing has always been regarded as a profession for women (Zamanzadeh, Valizadeh, Negarandeh, Monadi and Azadi, 2013; Evans

and Frank, 2003; Neighbours, 1999). According to Neighbours (1999), nursing combines professional values with feminine values of caring and support. However, as indicated in this study, males are gaining ground in nursing. Neighbours (1999) also notes that the major rationale for attracting men into nursing is to gain a high status in the profession.

It is also argued that men in nursing profession have faster and more straightforward career progression (Zamanzadeh et al., 2013; Muldoon and Reilly, 2003). Furthermore, the literature indicated that for men, practical motivation such as, job security, and diversity nursing offers are of utmost importance, and women are attracted to nursing mostly for altruistic desires and feelings of self-empowerment (Stanley, Beament, Falconer, Haigh, Saunders, Stanley et al., 2016; Zamanzadeh et al., 2013; Zysberg and Berry, 2005; Boughn, 2001). Whether or not this will actually work is debatable.

In the context of Rwanda, men are increasingly entering into nursing and midwifery, as indicated in this study where the gender profile of the 227 nursing students who participated in this study was 64.3% of females and (significantly) 35.7% of males; in the category of nurse educators, the profile was 68.2% of females and 31.8% of males. Nursing continues to be a largely female-concentrated occupation. The percentage of men in nursing internationally varies from 3.5% in Denmark, 25% in the Philippines and as a high as 38% in Jordan (Carrigan and Brooks, 2016; Christensen and Knight, 2014; Abushaikha, Mahadeen, Abdelkader and Nabolsi, 2014; Purnell, 2007). In Australia, men in nursing account 11.38% (Nursing and Midwifery Board of Australia, 2014). These figures are comparable with other countries where the proportion of men in nursing is similarly low, 10.7% in the United Kingdom (Office of National Statistics, 2011), 9.6% in the United States of America (U.S. Census Bureau, 2013) and 9% in Canada (Government of Canada, 2013). However, Regardless of the actual figure in individual countries, men in nursing are clearly in a minority. This gender imbalance presents a problem since it ignores diversity, which, as O' Lynn (2013) argues, is crucial in the nursing workforce. The benefits of diversity, from the viewpoint of the male nurse, are to make the workforce more welcoming and accommodating towards men, encouraging a larger number of male recruits and reducing male attrition (Sherrod, Sherrod and Rasch, 2005).

The findings further revealed that in 44 nurse educators, the minimum age was 27 years and the maximum age was 57 years: mean age was 34.59 years and standard deviation (S.D) was 7.21. For the age of nursing students, the minimum was 28 years old and the maximum was 50 years old; mean age was 36.09 years and the standard deviation (SD) was 4.434. This indicates

that nursing students enter e-learning at an advanced age (mature entry), compared to the regular students who enrol in nursing school after they have completed secondary schools (also known as a direct entry). This implies that adult teaching methodology should be applied, and e-learning is one approach which can be applied in adult education. E-learning engages nurses irrespective of their age by putting in place a learning environment where they are actively involved. Bednarz, Schim and Doorenbos (2010) reported that increasing diversity in the classroom poses major challenges to nursing education. As has been reported by nursing students in this study, it is sometimes hard to work and study, as they feel overloaded with work, and had family responsibilities. According to Dalhem et al. (2014), continuing education in a clinical environment is challenging for all healthcare organisations. The challenges of family commitments among second-degree accelerated nursing students have received some attention. Family obligations often leave little time for study (Bednarz et al., 2010; Wong, Seago, Keane and Grumbach, 2008).

Regarding highest qualification of the nurse educators, it was found that the majority (70.5%) did not have a qualification in nursing education, and only 29.5% reported having a qualification in nursing education. The findings indicated that 54.5% had a bachelor's degree, 22.7% had an honour's degree, 18.2% had an advanced diploma, and 4.5% had a master's degree. These data corroborate the qualitative data, where the majority of the participants reported that they entered their nursing teaching career after completion of their bachelor's degree in nursing without any qualification in nursing education.

The literature indicated that although registered nurses are eager to share their clinical expertise as nurse educators, many of them have questions about what is required to transition from the clinical practice setting to the academic environment, even on a part-time basis (Penn, Wilson and Rosseter, 2008). The literature revealed the need for qualification in nursing education at various levels in order to provide quality education. In many teaching institutions, instructors are estimated to teach at various levels, so the more educational preparation they have, the more versatile they can be (Penn et al., 2008). Although preparation in nursing education is important for teachers, it is imperative to have advanced clinical education or expertise, and the transition from practitioner to educator is not always smooth. Considering the sociodemographic differences observed in the nursing institutions – in particular, age, gender, working experience and qualification of the participants – it is important to improve the cultural competencies in teaching and learning institutions (Bednarz et al., 2010).

### **5.3 CONCEPTUALISING THE CORE PHENOMENON: E-LEARNING UTILISATION IN NURSING AND MIDWIFERY EDUCATION**

A phenomenon is defined as the central idea, event or, happening about which a set of actions/interactions is directed at managing or handling, or to which the set is related (Strauss and Corbin, 1990). To define the concept of e-learning in nursing education, the shared meaning and theoretical corroboration of the empirically grounded categories that emerged from the data and actions were classified into three dimensions. E-learning in nursing education was conceptualised as: (a) a mechanism to advance a political agenda; (b) a tool to open access to education for working nurses and midwives; (c) a student-centred approach, (d) blended learning (face to face and online via Moodle).

#### **5.3.1 E-learning as a mechanism to advance political agenda**

In this study, data sources indicated that e-learning is conceived as a mechanism to advance the political agenda in the field of education, health and technology in the context of Rwanda. Since 2000, government in Rwanda has put in place foundations and empowering environment for ICT development. Today, the existence of a conducive legal and regulatory framework, availability of good infrastructure and a growing and innovative human resource base are further positioning Rwanda as a regional ICT hub (Republic of Rwanda, 2015b).

Data indicated that guided by its Vision 2020, Rwanda has made important advances in various sectors of the country. Data revealed that the Rwanda Vision 2020 is a framework for Rwanda's development, presenting the key priorities and providing Rwandans with a guide for their future development. In this study, the principal focus was on education, ICT, Health and the population in relation to Vision 2020 (Republic of Rwanda, 2012c). In education, the country has made tremendous steps towards ensuring universal education for all, which is one of the most important Millennium Goals. In Vision 2020, there is a major emphasis on vocational and technical training in the fields of technology, engineering and management, targeting secondary and tertiary levels, and seeking to promote efficiency and continuous upgrading of skills, together with large-scale employment creation programs. There is also an emphasis on on-job-training, in-service training and distance learning (Republic of Rwanda, 2012c).

Emerging data showed that Rwanda will continue to rely on imported technology from advanced countries, and that well-trained, specialised nationals will be essential to the running

and maintenance of technological systems, ranging from medicine and agriculture to industry and telecommunications. It is in line with this that the government has promoted partnership and collaboration with various stakeholders, and in particular US faculty, in order to introduce e-learning in nursing education. It emerged from this study that the partnership with US faculty in the field of nursing education has provided technological support, pedagogical support, financial support and research support (Mukamana et al., 2015; Republic of Rwanda, 2012c; Rwanda HRH, 2011).

The data sources indicated that in the health sector there has been a special focus on addressing the shortage of specialised health personnel and improving the quality of healthcare and health policy, while continuing the successes of home-grown solutions like the community health workers model. The Rwanda Ministry of Health is an aggressive user of technology, and has initiated the transformation of nursing and midwifery education through its 2012-2018 strategic plan by upgrading nurses with A2 level (diploma) to nurses with A1 level. This is done through e-learning in nursing education (Rwanda Ministry of Health, 2012b).

Advancing the political agenda through e-learning is in line with Law N° 27/2013 of 24/05/2013 establishing the Higher Education Council (HEC). The primary objective of the HEC is to enhance the quality of education and make sure that those graduating from higher institutions are knowledgeable for the betterment of the Rwandan residents' welfare and for national development (Republic of Rwanda, 2013b).

Data sources indicated that skills development increasing the quality and quantity of the skilled personnel needed to drive ICT development and achieve EDPRS is a national priority and a crucial foundation for building a knowledge-based society (Republic of Rwanda, 2015b). To fast-track Rwanda's ICT development and transformation into a knowledge-based economy, there must therefore be programs to train ICT personnel and campaigns to attract more Rwandans in the field of ICT, particularly at technical and vocational education and training (TVET) institutions. Institutions of higher learning such as TVET institutions and universities together with the private sector can collaborate to ensure the development of industry-specific skills. This project aims to increase home-grown ICT expertise that meets national, regional, and global ICT needs (Republic of Rwanda, 2015b).

### **5.3.2 E-learning as a tool to open access to education for the working nurses and midwives**

Data sources indicated that e-learning is conceived as a tool to open access to education for working nurses and nurses. The findings from this study indicated that the project to introduce e-learning in nursing schools was initiated by Ministry of Health in partnership with various stakeholders such as Rwanda Human Resources for Health (Rwanda HRH), with the main goal of upgrading the level of nurses from diploma level (A2) to advanced diploma (A1). The objectives were to train competent nurses and midwives who can respond to the needs of the Rwandan population in any health setting, to promote self-directed learning and life-long learning, and to produce nurses who will be critical thinkers.

Data sources revealed that nurses are a significant component of the health workforce, but also that there is a need to increase the number of healthcare professionals by training more qualified nurses (Rwanda HRH, 2011). Data sources indicated that e-learning was used in nursing education for an urgent increase in the supply of health workers, since traditional classroom training in specific institutions had proven to be insufficient to accommodate all those with nursing diplomas obtained in the previous system of training. The new training program would address the critical shortage of qualified nurses in Rwanda, and result in improved health services, particularly in remote areas (Binagwaho, Kyamanywa, Farmer, Nuthulaganti, Umubyeyi, Nyemazi et al., 2013; Rwanda HRH, 2011).

A similar program for upgrading the qualification level of nurses from an enrolled nurse (EN) to registered nurse (RN) through distance learning has been reported in Tanzania. This is the EN–RN Conversion Diploma Programme, supported by the Aga Khan Development Network, which has been offered in Tanzania in distance-learning mode since 2006. This type of learning allows the students to use ICT tools in learning, and to interact with teachers who offer them the needed support. Integration of theory into practice is emphasised as students as the students use their acquired knowledge into their clinical practicum (Aga Khan Development Network, 2007).

Data sources indicated that e-learning creates a new environment for teaching and learning in which rich content can be deployed easily, quickly and cheaply. It allows virtual communication among teachers and learners through e-mail, discussion forums, chats, audio/videoconference and instant messaging (Ferschke, Howley, Tomar, Yang and Rosé,

2015; Kim, 2013; Khan, 2005). The internet makes almost infinite worldwide resources available to learners. E-learning allows flexibility of time and distance for teachers and learners (Dalhem and Saleh, 2014; O'Lawrence, 2007). It emerged from the current study that e-learning is linked to the utilisation of ICT in teaching and learning, and helps to give access to education for working nurses and midwives. In e-learning, the use of ICT is a cornerstone because it increases collaboration between educators and students and supports innovative pedagogy. It was also found that e-learning allows students to work in teams and share ideas related to the curriculum and to learn new skills. The use of ICT tools such as Moodle in e-learning encourages independent and active learning, assists in information retrieval and increases learners' motivation, self-confidence and self-esteem (Dalhem and Saleh, 2014).

In this study, the findings indicated that e-learning provides opportunities to use technology for remote access to information without being restricted by time (e.g. working hours of the library) or distance (e.g. travelling to the library). The flexibility it creates allows access to numerous open-access online resources rather than just to subscription-based resources from database and eBook vendors. E-learning provides options to search solely for open-access resources (Dalhem and Saleh, 2014; Brown et al., 2014; David, Salleh and Iahad, 2012; McVeigh, 2009; Mills and Tait, 2002).

### **5.3.3 E-learning as a student-centred approach**

Participants conceptualised e-learning in nursing education in terms of what it is and what it represents in the context of Rwanda. In this regard, participants reported that e-learning in nursing education is a student-centred approach that (a) promotes self-directed learning, (b) is collaborative, (c) is inquiry-based learning, (d) is interactive learning, (e) promotes active engagement, and (f) promotes the integration of theory and practice.

Data from this study showed that e-learning in teaching practice is important because it promotes and fosters the skills associated with becoming autonomous, self-directed learners. Self-directed learning skills can be developed and promoted within such environments through careful design of interactive tools that encourage self-management, self-monitoring and motivation. One of those tools is an e-learning system through which individual learners can become empowered to take increasingly more responsibility for various decisions associated with the learning endeavour. Self-directed learning can be supported through open learning programs, personalised learning possibilities, and other innovative approaches.

Participants in this study also reported that interactive learning was a way of engaging the students, and keeping them motivated for a better understanding of the lesson. Participants reported making the lesson more interactive by using videos, pictures, PowerPoint animations, forum discussions, and chatting, including web links via the learning management system, which attracted students' attention. Some teacher participants use social media and teamwork to make e-learning more interactive. Student participants reported use of ICT tools for purposes such as accessing learning resources, following the course whenever convenient without necessarily being at school, and searching for information about diseases even when they were on clinical placement. The rich information provided by the participants revealed that using ICT tools is a necessity in e-learning.

These findings corroborate quantitative data where participants reported promotion of student-centred teaching and learning activities using the e-learning platform. Levels of technology use reported in this regard were as follows: 96.9% of nursing students used the internet to access full web-placed courses, 93% for communication with their lecturers, 93% only for information on the course, 91.2% for course registration, 87.7% for major components of the course on the web, 86.3% for thematic student-to-student communication, including with students from overseas, 85.9% for online admission, 82.4% for support on web, 81.9% for database browsing, 79.7% for mining information, 78% for collection and analysis of information. The findings showed the relatively high utilisation of the internet for academic-related activities. In the calculation of overall scores, the minimum score was 26 and the maximum was 70. The mean of response score was 45.621, the median was 45 and the standard deviation was 9.159. An average of 70.9% had a score of 50 which indicates a relatively high utilisation of the internet for academic-related activities.

The literature indicated that self-directed learning is a type of learning in which students are allowed to work on authentic problems and tasks of their own choice, and are provided with learning support relating to their problems (Saxena, 2013; Dawson, Macfadyen, Evan, Foulsham and Kingstone, 2012). This process keeps students engaged, since now they have to acquire knowledge on their own and apply it along with their skills to find solutions to their problems, thus evolving in their learning and being encouraged for lifelong learning (Saxena, 2013). Learning through self-direction can be refined and amplified with the use of technology. Technology can support lifelong, self-directed learning beyond the regular classroom (Saxena, 2013). Rapidly changing business and social environments require the development of

constantly learning, creative, independent, responsible and autonomous people (Kai, 2009). All this has implications for the e-learning systems used in universities and for learning design principles. The proliferation of ICT has modernised teaching and learning in higher institutions. It offers possibilities to access information remotely via the web. With open educational opportunities, informal and self-directed learning, ICT is becoming part of everyday life (Kop and Fournier, 2011).

In this study nurse educators reported the use of activities that promote student-centred approaches: 95.5% reported using self-directed learning, 93.2% reported using case studies, 88.6% reported using group discussions, 81.8% reported using small group activities, 72.7% reported using formal lectures, 70.5% reported using role play, 68.2% reported using brainstorming, 63.6% reported using situation of integration, 63.6% reported using videos. An average of 50.0% reported doing research. And based on the responses from the participants, self-directed learning accounted for 60% of the time in an academic year. In self-directed learning, students learn from their own information, from lecturers or from other resources. However, it was found that the use of teaching strategies that promote student centred learning was related to other factors such as years of work experience; condition of accessibility to infrastructure in the target class; source and the type of support; ICT-based activities used for teaching and material, and perceived skills in ICT.

Data reflected that a student-centred approach promoted collaboration among the nursing students and their teachers. Data sources demonstrated that collaborative learning can occur in larger groups or peer-to-peer. Peer instructions or peer learning promotes the involvement of the students, either in pairs or small groups in activities that encourage discussions, and problem-solving. Similarly, in e-learning this can be done through forum discussion, chatting, and communication with peers or teachers through emails or social networks. Garrison and Vaughan (2008) argue that working collaboratively through assignments and team projects encourages students to take responsibility and design learning strategies. If expectations and guidelines are clear, team projects can offer opportunities to engage in relevant, realistic problem-solving. Learning activities are shaped, enhanced, and extended through collaboration in a blended community.

Study participants reported that they use a number of ICT tools for e-learning platform. These tools included: computers programs, Internet, Moodle platform; Automatic screen recording,

and Videos. Teacher participants reported that they use to prepare their lesson and post them on the LMS (Moodle), they help them to communicate with the students in their workplaces, as well doing research. In addition, teacher participants reported that they use these technologies to get updated information, because some of the books in the library are old. It emerged that technology enabled nurse educators to use images, PowerPoint and videos, and teach more students in less time. It was also noted that using technological tools helped the participants to keep records and transfer them easily.

Van Tassel and Schmitz (2011) proposed that, just as the nature of student-instructor interaction influences student learning, the extent to which these interactions meet students' expectations also shapes online learning outcomes. The authors modelled how students' personal characteristics, communication–interaction expectations, and actual interaction experiences influenced their course satisfaction and overall learning (Van Tassel and Schmitz, 2011). According to Anderson (2010), ICT is raising increasing interest in problem-based learning, particularly the research possibilities offered by the Internet and multimedia tools for collecting and presenting the result of research studies. Anderson (2010) states that specialised programs such as learning management systems, are often utilised to support innovative teaching. Through accepted learning approaches and up-to-date teaching principles, educators are supported in designing, delivering learning programmes, and this is a step in teaching with and through ICT is linked to the transforming stage in the ICT integration model.

In this study, quantitative data showed that social media were used to collaborate with colleagues and nurse educators. The most frequently used social networking sites were Facebook, Twitter, Student Village, WhatsApp, Skype and Myspace: 85.9% reported using Facebook; 29.5% used Twitter; 19.8% used Student Village; 15% used other applications such WhatsApp and Skype, and 8.4% used Myspace. The literature indicates that whether higher education is delivered face to face or through multimedia online instruction, core educational processes remain intensely communicative (Van Tassel and Schmitz, 2013). In online instruction, there is increasing recourse to social supports networks, and social support networks are crucial to learner development, especially during the first year of university (Ding and Stapleton, 2015; Jackson, 2013).

Social support, especially support from peers, is said to be an important buffer to the stress caused during school–university transition (Timmis, 2012). In a study by Ding and Stapleton

(2015) on self-emergent peer support using online social networking during the cross-border transition, it was found that students could also seek or offer practical and emotional support to each other. In their study on using Social Media for collaborative learning in higher education, Li, Helou and Gille (2012), found that with the rise of social media, Web users have become co-producers of social content rather than passive information consumers. Next to its wide usage for social interactions among young people, social media is also increasingly used to support learning activities (Li et al., 2012).

Data from this study showed that e-learning serves as a tool to enhance inquiry-based learning. Because inquiry-based learning is learning by doing and develop reflective practice, and is problem-based or project-based it is also interpreted as a form of discovery, allowing the students to reflect, observe and explore, plan and predict and thereafter experiment and reflect. Data from the participants revealed that e-learning helps in collecting information from various sources critically analysing them and then taking decisions. It was found that this was done through research on the internet. This is because it was found by the participants that e-learning provided more up-to-date information than the old books which can be found in the library. Inquiry-based learning was also reported to be done through the questions asked in the forum discussion or online discussions or assignments (Individual and group assignments) where learners have to have to find information from a number of sources in order to respond to the task given. Findings from the Moodle platform revealed that either teachers or students could initiate discussion, and most of the time teachers used open-ended questions. From quantitative data, it was found that inquiry-based learning by nursing students was done by searching for information from the internet using various databases; 94.7% reported using Google; 79.7% used Yahoo; 78.9% used Google Scholar; 43.6% used Ask; 10.6% used Bing; 8.4% used MSM; 4.4% used Alta Vista; 4.4% used Info Space.

According to Garrison and Vaughan (2008), an educational inquiry is a process of investigating problems and issues rather than memorising solutions. The emphasis of inquiry, in education, is on intended goals and learning outcomes. It is a systematic process of defining relevant questions, searching for relevant information, formulating solutions, and applying those solutions. A community of inquiry is based on sustained communication and collaboration wherein participants share experience and views. Participants are expected to be self-directed and focused on the task at hand (Garrison and Vaughan, 2008).

Anderson (2010), stated that adopting a student-centred learning in a classroom places a learner in a central position. It provides a voice for students, and their needs, abilities, interests and learning styles determine classroom activities, consequently helping to reduce dropout rates because students are self-motivated (Oliveira, Aarreniemi-Jokipelto and Boaventura, 2015; Anderson, 2010). The motivation is based on their background and experience. Problem-solving in a particular subject or discipline is not limited and may be related to other subjects and result in additional skills (Oliveira et al., 2015; Anderson, 2010). The data students collect in responding to problems which they have selected are not restricted by a specific area. Students learn from each other by working in small groups (Ficapal-Cusí and Boada-Grau, 2015; Anderson, 2010). Students collect information from the web, and may also use offline resources such as compact discs and books. As students research, analyse, synthesise and evaluate the information they collect, the tasks are very much student-centred (Anderson, 2010).

The finding from this study indicated that e-learning as introduced in nursing schools in Rwanda, allows the students to become agents of changes by using evidence-based practices. The indication from the data in this regard was that the integration of theory and practice leads students to provide care that is patient-centred and helps them to become critical thinkers, be creative, and make connections between what they have studied in theory and clinical practice. E-learning helped students in these programs to correct malpractices, and participants also reported that they were able to put into practice what they learned in class. Using authentic cases for learning facilitated the integration of theory and practice and assisted them in developing critical thinking and clinical problem solving, and nurtured a culture of patient-centred care. This corroborates the findings from quantitative data that nursing students had a positive perception of the e-learning outcomes. Seventy-four per cent indicated that their attitudes had changed, 73.6% indicated that they had acquired proficiency in using the internet, 73.6% indicated that they would be able to use the new skill throughout their career, 73.1% indicated that they had applied the new knowledge in their lives; 72.7% indicated that they had developed new skill in ICT; 72.2% indicated that the course project was in line with their expectations; 72.2% indicated that they had gained more knowledge about technology; 72.2% indicated that they had derived new ideas from the new knowledge.

Mather and Cummings (2015) state that integration of health technology and informatics in healthcare settings has allowed new opportunities for developing patient-centred approaches

to care. A study by Dhlamini (2011) on how the integration of theory and practice in nursing education is perceived by students and nurse educators found that educators favoured problem-solving approaches rather than the conventional method of teaching and learning. Participants in the Dhlamini study also alluded to the use of case studies and real-life or clinical problems to stimulate teaching and learning, together with reflections on theory in relation to practice experiences and vice versa. In addition, nurse educators gave preference to guided reflection as a learning technique with the aim to integrate theory and practice. Self-directed learning (SDL) was likewise seen as an element in problem-solving approaches that facilitates the integration of theory and practice in nursing education (Dlamni, 2011).

Data from this study indicated that e-learning provides technology to get information remotely without being restricted by time (e.g. working hours of the library) or distance (e.g. travelling to the library). E-learning allows 24/7 access to many online resources that are open access, or available to everyone, rather than just to subscription-based resources from database and e-book vendors. E-learning provides options to search solely open-access resources. Participants reported that e-learning provides an opportunity to access a wider range of resources, anytime and anywhere. These findings corroborated quantitative data where nursing students reported that they were aware of the existence of the electronic resources: 93.4% were aware of electronic resources on the Internet, and 94.3% were aware of the existence of electronic resources on campus. Nursing students participants reported that their information about electronic resources came from various sources: 82.4% from their lecturers, 72.7% from Google Scholar; 67.4% from library orientation; 58.6% from Yahoo; 49.8% from fellow students; 28.6% from the library web page.

E-learning supports the use of ICT and provides accessible, resource-efficient methods for clinical skills education (Garrison, 2011; McVeigh, 2009). Students mostly engaged with e-learning through the institutional virtual learning environment, where course materials and resources are accessed (Moule, Ward and Lockyer, 2010). E-learning can provide flexibility in not only how, but also where and when students learn. It can also offer a way to individualise the educational experience in terms of pacing learning in accordance to the learner's needs while retaining consistency in what is taught (McVeigh, 2009; Sit, Chung, Chow and Wong, 2005).

Data sources indicated that an active engagement of adult students in their own learning is essential to assist the students build their own knowledge. Through e-learning, students actively participate in the learning process in partnership with teachers and other students. Students' contributions are respected by other students and the teacher, and the challenges. Active involvement is achieved through face-to-face and online interactions. In online participation, the students interact with teachers and peers either synchronously or asynchronously. In synchronous participation, students engage in the real-time. This is done through the use of instant messaging or live chat, webinars and video conferencing which allow for students and teachers to collaborate and learn in real time (David et al., 2012; Khan, 2005; Mills and Tait, 2002). In asynchronous participation, the information is shared among a network of people, outside of real time and place. In asynchronous participation, communication is done through email, electronic mailing lists, threaded conferencing systems, online discussion boards/forums, chatting, wikis, and blogs, and Moodle as the learning management system will facilitate discussions, posting and replying to messages, and uploading and accessing courses and multimedia (Ficapal-Cusí and Boada-Grau, 2015; David et al., 2012; Khan, 2005; Mills and Tait, 2002).

#### **5.3.4 E-learning as blended learning**

Data sources indicated that e-learning was a form of learning that combines online and face-to-face learning. It was noted that e-learning was viewed as a tool that uses ICT in teaching and learning, allowing access to resources anytime and anywhere, making it cost-effective and time-saving.

From the data of this study, it emerged that e-learning and its blended mode contained face-to-face teaching and learning sessions, because it allows nursing students to maintain a connection to the campus and their peers, and promotes a stronger student–instructor connection. Though the face-to-face part of e-learning, nursing students and teachers create a social interaction through group collaboration to facilitate high achievement, promote verbal and nonverbal communication. The teaching sessions are done in real time and with specific time frames for discussions. Numbers of methods have been reported such as brainstorming, group work, group assignments, student presentations, the use of videos and demonstrations, lecturing and giving test and exams while they are at school.

Data from this study indicated that blended learning allows the participants to be more engaged whether face to face or via web-based LMS (Moodle). Participants reported that this form of blended learning is flexible because a number of resources are made available to students, and students may become proactive in their learning through forum discussion, chatting, doing quizzes and assignments. Data from this study indicated that e-learning is associated with the utilisation of ICT in teaching and learning. It emerged from this study that ICT was of assistance in preparing and delivering lessons and sequencing classroom activities. In e-learning, the use of ICT is a cornerstone because it increases collaboration between educators and students and supports innovative pedagogy. It was also found that ICT allows students to work in teams and share ideas related to the curriculum and thereby learn new skills. The use of ICT in e-learning encourages independent and active learning, assists in information retrieval, and increases the learner's motivation, self-confidence and self-esteem.

Technology can be a catalyst to embrace innovative teaching approaches (Xiao and Meier, 2011; Garrison and Vaughan, 2008). Blended learning has a lot of advantages in higher education, and at the heart of blended learning, redesign is the goal to engage students in critical discourse and reflection. The goal is to create dynamic and vital communities of inquiry where students take responsibility for their own learning through active participation in the inquiry process (Türel, 2016; Garrison and Vaughan, 2008).

In this current study, it became evident that participants indicated that e-learning provides an opportunity to use technology to get remotely information without being restricted by the time (e.g. working hours of the library), nor restricted by distance (e.g. travelling to the library). Participants reported that they can access the courses easily from their workplaces, and do some assessments and quizzes without necessary being at school. However, participants reported that there should be motivation and proper use of the internet in order to access these resources. The literature reveals that with the growing use of ICT in the educational setting, blending learning approaches can contribute tools to complete face-to-face experiences (Ginns and Ellis, 2009). According to Bodie, Powers and Fitch-Hauser (2006), blended learning refers to a method of instruction that utilises two or more complementary approaches to teach the same material, through combining classroom lectures, activities, discussions, and/ or web-based modules.

The literature reveals that e-learning can help overcome issues related to the location, time and individual limitations which are characteristic of traditional educational systems. By providing offsite educational opportunities, e-learning offers the opportunity of flexibility to accommodate everyone. Accordingly, students have to learn wherever, and whenever they have access to computers and internet. This is done usually through a learning management system, that facilitates communication and collaboration between teachers and students. For this purpose, forum discussion and chat rooms are used (Rabiee et al., 2013; Pawlowski, 2006). The accessibility of electronic resources is essential for the success of e-learning. It crucial for higher education institution to emphasise on accessibility to internet, as it is the entry point to e-learning (Phipps and Kelly, 2013).

Data from this study indicated that in e-learning there were benchmarks for online teaching and learning, and in e-learning there is an emphasis on student collaboration which is important through a variety of ways including, forum discussion, e-mails, chat groups, and feedback on student tasks and questions. Students are instructed in the proper methods of effective research, including assessment of the validity of resources. For online teaching and learning to be effective course development benchmarks should be considered. This includes guidelines regarding minimum standards for course development, design, and delivery, and for determining the technology to deliver course content. Instructional materials are revised from time to time to certify that they are in line with educational standards of a given field. Using e-learning in its blended mode provides a hybrid mode of instructions, where students acquire a variety of competencies.

Those results corroborate the quantitative findings where 97.7% of the nurse educators used computer and Internet in preparing lessons and 97.7% in class teaching in front of or with the students. However, it was found that the frequency of ICT use in all lessons by nurse educators varied considerably, with 52.3% using the internet in more than 75% of all lessons, 22.7% in between 71 to 50% of lessons; and 18.2%, and 2.3% respectively in 11 to 24% of all lessons and 6 to 10% of all lessons. The study indicated that in blended learning a number of teaching strategies were used in micro curriculum by nurse educators: 95.5% reported using self-directed learning; 93.2% reported using case studies; 88.6% reported using group discussions; 81.8% reported using small group activities; 72.7% reported using formal lectures; 70.5% reported using role play; 68.2% reported using brainstorming; 63.6% reported using situations of integration; 63.6% reported using videos; 50% reported using research; 43.2% reported

using workbooks; 27.3% reported using projects; 25% reported using core lectures; 11.4% reported using portfolios.

Working with students in a blended learning environment from early in nursing programs enables students to more clearly envision the gap between their current level of competence and that of the nursing practitioner role (Rossiter and Day, 2016). Adopting a blended learning approach, informed by effective adult learning principles, combined with a clear understanding of practice in students' clinical settings, is one way to use sequential blended face-to-face and online learning opportunities to engage students in learning about their future role (Rossiter and Day, 2016).

As already noted from the findings of this study, blended learning included face-to-face teaching. In face-to-face interaction with the nursing students, of 44 nurse educators, 100% reported that students give presentations to the whole class, 100% reported that students take tests and assessments, 100% reported that students are engaged in inquiry-based activities, 100% reported that students discuss ideas with other students and the teacher, 100% reported that students reflect on their learning, 97.7% reported that they present, demonstrate and explain to the whole class, 97.7% reported that students work in groups, 97.7% reported that students work on exercises or tasks individually at the same time, 95.5% reported that they support and explain things to individual students, 95.5% reported that students participate in assessing their work, and 88.6% reported that students work alone at their own pace. The study revealed a number of e-learning activities performed by nursing students such as watching videos, doing role play, workbooks, projects, assignments, case studies, portfolios, evidence-based practice, research articles and simulation/situation of integration. Of 227 nursing students, 89.9% reported assignments, 87.2% reported case studies, 80.2% reported videos, 73.1% reported role play, 67% reported workbooks, 61.2% reported evidence-based practice/research articles, 55.9% reported projects, 12.3% reported portfolios, and 11.5% reported simulation/situation of integration.

According to Garrison and Vaughan (2008), courses being offered in the blended learning format promote active, self-directed learning by establishing an adequate connection between in-class teaching and online learning. Every teacher tries to create quality learning material. Some do it systematically from a didactic framework or from existing material, others do it intuitively and artistically from an implicit beliefs-based approach (Clement, Vandeput and

Osaer, 2016). Students are expected to be sufficiently creative to think of 'learning activities' to process the content. An education curriculum can therefore show a variety of different courses with a range of different technical and educational approaches (Clement et al., 2016). However, in blended learning approach it is necessary to use technology more than in face-to-face teaching and that is why it is necessary to facilitate a shift in culture between both teacher and student in utilising technology (Jokinen and Mikkonen, 2013; Johnson, List-Ivankovic, Eboh, Ireland, Adams, Mowatt et al., 2010).

Garrison and Vaughan (2008) state that blended learning provides a diversity of possibilities for evaluation. The online environment allows learners to show and share proof of their learning through papers, electronic portfolios, project reports, and practice tests. The digital nature of these learning artefacts also allows for student and peer involvement in the evaluation process (Eady and Lockyer, 2013; Spiller, 2009; Garrison and Vaughan, 2008). Documents may be shared with peers for informal input before final submission or to form part of the assessment. There may also be benefits for a student self-assessment to form part of the final mark. Self-assessment can also encourage and enhance metacognitive awareness (Spiller, 2009; Garrison and Vaughan, 2008). Completing exams online is an option, but invigilation of formal examinations has an obvious advantage in the face-to-face context. Serious thought should also be given to assessing discourse, especially online. Although this is a common practice, it is a complex issue and the advantages and disadvantages need to be weighed carefully. The argument in favour of grading discussions is that it provides incentives to participating and gives recognition to the efforts to engage constructively in the discourse (Garrison and Vaughan, 2008).

Regarding access to the internet, quantitative results revealed that nursing students accessed the internet from various settings such cybercafés or other settings open to the public, libraries, at home, at a friend's, at school and at work. Of 227 nursing students, 96% accessed Internet services at school, 77.1% accessed Internet services at work; 71.4% accessed Internet services at home, 59.9% accessed Internet services at the cybercafé or other settings open to the public; 56.8% accessed Internet services at the library; 44.9% accessed Internet services at a friend's. Those results indicated that there are significant numbers of the students who cannot access the internet when they are not at school. This corroborates with qualitative findings where nursing students reported to have difficulties to access the internet in particular in remote areas. The results from Google Analytics confirm that the majority of users are from the big cities where

the access to the Internet is high. Although there is internet penetration and digitalisation of the country via fibre optics, with a number of Internet companies offering Internet services (e.g. MTN Rwanda, Tigo, Airtel), and although users of mobile phones have increased recently, the digital divide is still significant, particularly regarding age, location, income, and social status, as has emerged from this study.

The literature reveals that learning delivery is the most often cited advantage of e-learning, and includes increased accessibility of information, and ease of updating content. Improved access to teaching and learning resources is central, as learning is often an unplanned experience. Updating electronic content is easier than updating printed material; e-learning technologies allow teachers to revise their content simply and quickly. Learners are self-directed and goal oriented, and this permits them to adapt their experience to meet personal learning goals. Internet technologies permit the widespread distribution of digital content to many users simultaneously anytime and anywhere (Bichsel, 2013; Clark and Mayer, 2011; Ruiz, Mintzer and Leipzig, 2006). Bichsel (2013) further argues that offering more courses online can also improve efficiency and decrease the cost by limiting reliance on often scarce physical classrooms.

Quantitative data showed that e-learning was positively perceived by nursing students participants. Using a DDLM (demand-driven learning model) in which the constructs were contents, delivery, services, outcomes, structure, and evaluation in e-learning, it was found that nursing students had a positive perception overall.<sup>1</sup>

The DDLM was formulated from a constructivist theoretical paradigm to meet the learner's (consumer's) demands for quality content, delivery, and service within an evolving technological environment (MacDonald, Stodel, Farres, Breithaupt and Gabriel, 2001). An extensive literature covers the use the Demand-Driven Learning Model (DDLM) in education (Din, Nordin, Jusoff, Nordin, Zakaria, Mastor et al., 2011; Colla J. MacDonald, Stodel, Hall and Weaver, 2009; MacDonald, Breithaupt, Stodel, Farres and Gabriel, 2009; Breithaupt and

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<sup>1</sup> Findings and discussion were published in the *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*, under the title “**Analysing Nursing Students’ Perception on the Utilization of E-Learning Platform in Rwanda: A Descriptive Study**” in e-ISSN: 2320–1959.p- ISSN: 2320–1940, Vol..5, No. 2 Ver. III (Mar. - Apr. 2016), pp. 19-39.

MacDonald, 2008; MacDonald and Thompson, 2005; Maneschijn, 2005; MacDonald, Stodel, Farres, Breithaupt and Gabrie, 2002).

Quantitative data from this study showed that nurse educators had positive opinions about the impact of using ICT on student learning, and an overall score was calculated for the positive impact of using ICT on student learning. The minimum score was 13 and the maximum score was 28. The mean score was 22.57, Standard Deviation was 4.4 and the median was 23; 1st quartile was 19, 25, 2nd quartile was 23, and the 3rd quartile was 26. These findings indicate that the majority of the participants had a positive opinion about the impact of using ICT on student learning. The findings showed an overall positive attitude of nurse educators towards ICT use in school. An overall nurse educators' attitude score was calculated on ICT use in school: the minimum score was 20, maximum score was 40, mean score was 33.14, the standard deviation was 5.156, and the median was 32.50; 1st quartile was 30, 2nd quartile was 36 and 3rd quartile was 39. This indicated teachers' positive attitude toward ICT use in school.

It is found that perceived ease of use or effort expectancy is the most important factor for teachers, while perceived usefulness or performance expectancy is the most important factor for students (Umrani-Khan and Iyer, 2009; Jung, Loria and Saha, 2008b). This means that even though a student might have a positive attitude towards the system he might still end up not using it. This could indicate that students would like to use the system more but do not have the option, as the teacher might not fully utilise the system's potential in the course. The reverse case would be that a student does not appreciate the system but will still use it. This might be explained by the student perceiving it as necessary to use the system or even be forced to use it during the course (Jung et al., 2008b).

#### **5.4 ANTECEDENT AND CAUSAL CONDITIONS**

To recap, antecedents or casual conditions are those events or incidents that lead to the occurrence or development of a phenomenon (Strauss and Corbin, 1990) which in the context of this study is the utilisation of e-learning platform in undergraduate nursing schools.

Five main categories emerged from this study as antecedents: (a) Reforms in nursing education; (b) Inadequately prepared graduates; (c) Insufficient number of graduates; (d) Need to upgrade larger numbers of graduates from the level of A2 nurses to A1; (e) The nature of the graduate produced after engaging in the new curriculum.

#### **5.4.1 Reforms in nursing education**

Data indicated that the changes proposed by healthcare reform have the potential to significantly alter the environment in which nurses and other healthcare professionals will practice. The role of nursing education is pivotal in realising a transformed healthcare system. Data demonstrated that the training of nurses and midwives in Rwanda can be traced back to the colonial era. Although several reforms have been made in nursing and midwifery education, A2 nurses still have a low level of education with training at secondary school level. It emerged from the data that the curriculum used was content based, which made them inadequately prepared to meet the needs of the population. It emerged from the findings also that A2 nurses constitute the majority of the nursing workforce and are widespread across the country. Data sources showed that a number of reforms had taken place, and that there has recently been an emphasis on training nurses at an advanced level, by upgrading all A2 nurses to A1 level. This was done in an effort to improve the quality of nursing education and standardise graduation requirements. The Government of Rwanda approved a new nursing curriculum to include core competencies and specific benchmarks for graduation.

The content-based curriculum is founded on a transmission model which has been used for many decades; according to Quinn and Hughes (2007), the transmission model of teaching conceptualises teaching as a process in which the teacher transmits knowledge, skills and attitudes to the students, who are subsequently considered to have learned these capabilities. This model has been the basis of teaching for centuries and is still very much evident in the lecture method used in higher education. However, the model is not without its critics, who question the relatively passive role of the student in the process. Their reservations are neatly expressed in the aphorism ‘the lecturer’s notes are transmitted to the student’s notes without passing through the brains of either’. Indeed, the model is often termed the ‘empty vessel’ model, implying that the students are empty vessels waiting for the teacher to fill them up with learning (Quinn and Hughes, 2007). In his study conducted in South Africa on transformation on nursing education, Mekwa (2000) notes different challenges which have hindered the development of the nursing profession. This includes lack of standardisation of nursing programs and unnecessary replication of the course contents as students progressed from basic programme to another, and in some situations the learning content was similar (Mekwa, 2000).

Although nursing went under several reforms in the past in Rwanda, the curriculum used was judged content based, thus inadequate to provide enough skilful nursing workforce to deal with

health issues in the country (Harerimana, Mtshali, Mukamana, Kimonyo, N.Kayihura and Mugarura, 2015; Mukamana et al., 2015). Folk (2016), and Handwerker (2012) argues that to present day nursing has become an ever-changing and challenging career filled with many complexities such as escalating medical acuity of patients, increasing technological demands on nurses, social inequity, profit-driven medical systems, staff shortages, and ever-increasing ageing populations with widespread cultural needs.

#### **5.4.2 Inadequately prepared graduates**

Data from this study indicated that historically, there were three levels of training for nurses and midwives in Rwanda: A2, A1, and A0. A2 level nurses and midwives are trained at secondary school level while A1 nurses and midwives have an advanced certificate following three years of tertiary education. A0 nurses and midwives possess a bachelor's degree. The MoH decided in 2006 that training and deploying A2 level nurses and midwives should stop as their skills were deemed insufficient to provide quality patient care. The minimum requirement for a Rwandan nurse is thus now A1 (Rwanda Ministry of Health and Rwanda HRH, 2011: 12-13). Data demonstrated that nursing students should be adequately prepared for their future professional role, in order to fit into the nursing workforce. However, the gap between theory and practice continues to be a problem in nursing and midwifery, and the newly graduated nurses often confront an array of physical, technical, and mental challenges in bridging the academic and clinical divide. Bridging the gap between theory and practice has implications for recruitment of students into the nursing program, as well as retention of newly educated nurses. Reflectively, it is time for the nursing community and the teaching institutions to utilise innovative strategies to expand and meet human resources in health requirements. A unified approach must be pursued to address existing challenges (Thatcher and Park, 2012; Institute of Medicine, 2011).

#### **5.4.3 Insufficient number of graduates**

Data sources indicated that considerable attention has been focused on the apparent shortage of health workers, and the potential impact of the shortage on country's ability to fight diseases and provide essential life-saving interventions. Not only are current numbers insufficient to meet health needs, but pre-service training is also insufficient to maintain absolute numbers of nursing graduates to fill the gap at different levels of the healthcare system. Data from this study revealed that in the competency levels acquired in the previous curriculum, a small

number of A1 graduates were being produced to fill the gap and it would take many years to upgrade the A2 level nurses who are the majority in all three nursing and midwifery categories currently existing in Rwanda (A2, A1, and A0).

Until 2012, more than 90% of the nurses have the lowest level of nursing training available (equivalent to secondary-school qualifications, or A2 level), A1 nurses represent less than 10% of the total pool of nurses. A2 nurses are relatively evenly spread throughout the country, though there are still disparities between districts, with a number of under-served districts in the South, West and Northern Provinces. On average there is about 1 nurse for a population of 1,500 in Rwanda (Rwanda Ministry of Health and Rwanda HRH, 2011: 12-13). The literature shows that there is a global shortage of health. The critical shortages, inadequate skill mix and uneven geographical distribution of the health workforce pose major barriers to achieving the health-related Millennium Development Goals (MDGs) (WHO, 2012; Joint Learning Initiative, 2004). The 47 countries of sub-Saharan Africa have a critical shortage of healthcare workers, the deficit amounting to 2.4 million doctors and nurses. There are 2 doctors and 11 nursing/midwifery personnel per 10,000 population, compared with 19 doctors and 49 nursing/midwifery personnel per 10,000 for the Americas, and 32 doctors and 78 nursing/midwifery personnel per 10,000 for Europe. And, whereas there are 28 doctors and 87 nurses/midwifery personnel per 10,000 in high-income regions of the world, there are only 5 doctors and 11 nurses/ midwifery personnel per 10,000 in low-income regions (Naicker, Eastwood, Plange-Rhule and Tutt, 2010).

In response to the insufficient number of graduates in the context of Rwanda, recently there has been a shift to adopt a modular system in public higher education institutions as an attempt to address the limitations of the credits system (Mugisha, 2010). It is argued that this credits system limited the transferability of students, restricted multiple entries and exits of students, made it difficult to compare graduates from the same educational system, and led to reluctance in accepting graduates from the system in the wider region (Mugisha, 2010). The credit system which was followed was criticised as having many courses which were no longer relevant to the needs of society as described in the preface of the Rwanda National Qualification Framework (Mugisha, 2010). The recent restructuring of nursing and midwifery education system saw Byumba, Kabgayi, Rwamagana, Nyagatare and Kibungo nursing schools elevated to higher education institutions (Rwembeho, 2013). In 2013 they were allowed to graduate their first students since 2007 (Rwembeho, 2013). Currently, those schools are under the

umbrella of the University of Rwanda, School of Nursing and Midwifery-CMHS-UR (Thuss, 2014).

#### **5.4.4 Need to upgrade larger numbers of graduates from the level of A2 nurses to A1**

Data sources demonstrated that government in Rwanda decided to phase out A2 level, and to upgrade these nurses to A1. Under the initiative of the Ministry of Health and other stakeholders a competency-based curriculum to replace the content based curriculum was developed in five nursing schools (Byumba, Kabgayi, Kibungo Rwamagana, and Nyagatare) in order to upgrade the level of nurses and midwives so that they are competent to respond to the need of the Rwandan population in any health setting, and to promote self-directed learning, life-long learners and critical thinkers. Government identified that there was a shortage of skilled workers and that the traditional methods were not preparing the learners to attain skills which would allow them to become responsible nurses who would provide optimum nursing care in the country at all health sectors and in the region (MINISANTE, 2007).

The literature indicates that many health facilities continue to use a large number of A2 nurses due to the lack of A1 nurses. It is however believed that this negative trend will change in a few years' time as most nurses and midwives are currently being educated in a three-year program at schools of nursing and midwifery throughout the country (Leuchowius, 2014). In recent years there has also been progress and transformation in the field of nursing and midwifery education with a number of private schools training nurses and midwives at different levels, and aligning themselves with the requirements of the Rwanda Higher Education Council. Two of those opened in recent years are the Kibogora Polytechnic and the Ruli School of Nursing and Midwifery. The principles of the Bologna process in higher education serves as a guide, where it enhances a wider access to higher education, study framework, student and staff mobility, effective outcomes and employability (Eurostat, 2009).

The literature revealed a need for curriculum reforms in nursing education. Most nursing leaders agree that significant curriculum reform is needed, although there are many opinions about the specific changes that should be made. Common themes in the literature that are associated with curriculum reform are related to the need for curricula that are responsive to changes in the healthcare delivery system, are research based, are collaborative, and apply pedagogical innovation (Folk, 2016; Handwerker, 2012; Giddens and Brady, 2007; Ironside, 2004).

The above literature indicates that there is a move to upgrade the level of competencies of students, in line with the changing world which requires more skilful staff in order to solve the emerging problems.

#### **5.4.5 The nature of the graduate produced after engaging in the new curriculum**

Data sources demonstrated that boosting pre-service training is clearly important but is a longer-term solution. Hence, a variety of complementary, shorter-term responses must be considered, and it is important not to ignore the more expensive, longer-term issue of pre-service training. It emerged from various data that the introduction of competence-based learning in nursing in 2007 had a positive impact on the graduates produced. Later a modular system was introduced in 2013, following the introduction of an e-learning system one year earlier (2012). All three changes promoted the use of active teaching methodology and active involvement of students in order to produce competent graduates able to face the daily health challenges in Rwanda. During the celebration of Nurses' Day this year, the Registrar of National Council for Nurses and Midwives commended nurses for the great nurses' role. The decrease of Mortality rate and in particular neonatal mortality might be an indication of the improvement in the Health sector due to competent graduates.

Steiner, Floyd, Hewett, Lewis and Walker (2010) argue that innovative teaching approaches are required in order to phase out traditional nursing education. E-learning emphasises the need for the teachers to change their roles to facilitators of the students. The concept of adult teaching should be considered in teaching adult learners. Registered nurses (RNs) returning to school enter with all the needs and requirements of the adult learner (Leigh, Whitted and Hamilton, 2015). Adult learning theories, specifically andragogy, posit that the instructor act as a guide in the learning process and encourages student participation through the connection of their own experiences to the content (Leigh et al., 2015; McGrath, 2009). As RNs, these learners possess varying levels of experiential knowledge when they enter mobility programs.

The study found that the curriculum documents being used, which emphasise the use of technology in teaching and learning and promote a student-centred approach, clearly show the nature of the graduates that should be produced on completion of their courses. The curriculum takes into consideration nursing students as adult learners who are actively involved in their learning, and have experiences from their workplaces to be shared with their colleagues, thus making the teaching process more dynamic. On completion of their program, nurses and

midwives have to write a licensing examination organised by the NCNM which allows them to work anywhere in the country and outside the country.

The literature reveals that educational technology has transformed the way that faculty can facilitate nursing competencies with the use of online learning. Online educational programs in healthcare have provided positive educational learning experiences (Leigh et al., 2015). Faculty in such formats have also been referred to as facilitators of learning. In online learning, faculty must support the student and assist each student individually in determining the most suitable pathway for that student (Steiner et al., 2010). The learner-centred approach is applicable to distance education in nursing, as well. This approach builds on the learner's existing knowledge formulated by academic and work experiences. The relationship between the faculty and the adult learner should be one in which faculty guide students and allow options to meet student's individualised needs to enhance their distance education program. The faculty and the adult learner share the responsibility of the learning process by allowing the students to choose their learning activities (Leigh et al., 2015; Bergström, 2010). The best-known concept of adult learning and possibly the most commonly practised theory of adult education is andragogy. This theory defines the importance of developing a learning experience tailored to adult learners (Leigh et al., 2015). The theory of andragogy has been shown to address the distinctive needs of adult learners by advocating communication between faculty and learner. The philosophies of andragogy stimulate trust between faculty and learner and also increase self-awareness in adult learner. When andragogical principles are applied, faculty and adult learner become partners in formulating course content and methods to meet the adult learners' needs (Leigh et al., 2015; Chan, 2010). McGrath (2009) identified andragogy as the most learner-centred method in adult education. The andragogical philosophy requires that faculty form a relationship with the learner allowing discussion and involvement. Evaluation methods are collaboratively agreed upon by both parties with the learner having accountability for their learning (Leigh et al., 2015). Because adult learners possess more knowledge, skills, and beliefs, the faculty may assume the role of facilitator and not instiller of knowledge (Leigh et al., 2015; Taylor and Kroth, 2009).

The modular system used in nursing education in the context of this study adds flexibility, and gives access to education for a wider community of nurses, who in the past couldn't access higher education. According to Parlakkilic (2015), modular course design allows flexibility in delivering the course materials. Modules can be improved independently of other modules;

failure of one module does not cause other modules to fail. In a modular design, one can change or add any module without affecting the rest of the system without technical help. In a modular design, one module can be re-used in other systems (Parlakkilic, 2015).

In Rwanda, statistics reveal a number of achievements in the field of health, such as reduction of infant mortality and improved vaccination coverage, health, and nutrition statistics. Institutional delivery is another important indicator of the healthcare status of pregnant mothers and newborn children. Although these achievements may not be attributable solely to the quality of education of healthcare professionals, adequate training of nursing staff in quality and quantity may have played an important role. According to the Rwandan Ministry of Education (MoE) (2014), health is clearly a priority of government, with particular emphasis on improving access to quality and appropriate health services to the poorest and most vulnerable groups of society. To achieve this objective, government has raised the level of public funding for health services with a view to strengthening the capacity of the medical personnel and the provision of adequate health infrastructure both at national and community level (MOE, 2014).

Infant mortality rate (IMR) is normally considered to be an important indicator of the health status of any society. In Rwanda, IMR has decreased considerably, from 139 per thousand in 2002 to 49 per thousand in 2012 and for children less than five years of age, the mortality has decreased from 227 per thousand in 2002 to 72 per thousand in 2012 (MOE, 2014; NISR, 2010). The current official policy of universal access to health in Rwanda includes, among others, universal access to medical insurance (MOE, 2014). Good progress has been made in this direction, since 88% of the population had medical insurance in 2012. Institutional delivery is another important indicator of the healthcare status of pregnant mothers and newborn children. The number of mothers giving birth at health facilities is seen to increase with rising levels of their education. In 2012, 69% of women delivered their babies at a health facility and 29% delivered at home, compared with 70% in 2005 (MOE, 2014). This clearly shows the impact of the increasing number of competent health professionals, and in particular nurses and midwives.

## **5.5 CONTEXT**

In this study the set of conditions governing the context of the research were: (a) Rwanda Vision 2020, (b) The transformation of higher education in Rwanda, (c) The transformation of

nursing and midwifery education, (d) Partnership with other higher teaching and learning institutions (US universities, through the HRH program) to upgrade nursing and midwifery education.

### **5.5.1 Rwanda Vision 2020**

Vision 2020, as revised in 2012, is a framework for Rwanda's development, presenting the key priorities and providing Rwandans with a guiding tool for the future. It supports a clear Rwandan identity, whilst showing ambition and imagination in overcoming poverty and division. The Rwandan government, together with its partners, donors, civil society organisations and the private sector, is now in the process of formulating more detailed sectoral plans for attaining the goals of Vision 2020. Vision 2020 has six priority pillars and three cross-cutting areas. In this study, the interest was in education; science, technology and ICT; health; and population.

**Education:** On the Education aspect of Rwanda Vision 2020, the country has made tremendous steps towards ensuring universal education for all, one of the most important Millennium Goals, major emphasis will continue to be placed on vocational and technical training in the fields of technology, engineering and management. This will be targeted at secondary and tertiary levels, as well as various sections of society (with particular emphasis on youth and women), to promote efficiency and continuous upgrading of skills, large-scale employment creation programs will be launched in the national institutions aimed at on-job-training, in-service training and distance learning. One crucial element to the achievement of Vision 2020 will be to ensure a proper link between education policies and sector development and labour policies. It is crucial to understand that the investment needed for the development of the secondary and tertiary sectors will not be effective without a suitably skilled labour force (Republic of Rwanda, 2012c: 10-11).

Garrison and Vaughan (2008) state that tertiary institutions should start putting in place facilities that support learning experiences, and responding to the needs of the society. In this regard government in Rwanda is fully devoted to the adoption of ICT in all segments of society, including education. Subsequently, the University of Rwanda has put in place the required technological infrastructure including the acquisition of an LMS (Moodle), with a view to advancing one of its ambitions to develop a student-centred, and technologically advanced teaching, learning, and research environment.

**Science, technology and ICT:** On Science, Technology and ICT, it emerged that the country is investing in developing adequate, highly skilled scientists and technicians to satisfy the needs of the transition to a knowledge-based economy. Having laid the foundations for ICT to take off in the country through the laying of the fibre optic cable network, Rwandans have a whole new world of opportunities to take advantage of. Another aspect related to Science, Technology and ICT is that to ensure a proper link between education policies and sector development and labour policies. Rwanda will continue to invest in developing adequate, highly skilled scientists and technicians to satisfy the needs of the transition to a knowledge-based economy (Republic of Rwanda, 2012c:17-18).

Similarly, a study conducted in Botswana by Thomas (2010) on developing a web-based blended-learning environment at the University of Botswana, revealed that up-to-date technologies impacted on the everyday life of individuals, and the society in general. The environment appears to have an influence on a person's academic development. Growing up in an interactive, socially interconnected technology environment, compared with passive activities as listening to a lecture, can be a basis of an enormous change in the demographics, interests, needs, expectations and work habits of today's student population. When technology and its impact is pervasive in all aspects of our lives, our schools need to reflect what goes on around outside. Schools should attempt to bridge the gap between classrooms and real-world scenarios.

**Health and the Population:** Regarding the health and the population, it that Rwanda continues to have high population density, but with the success of current and future population policies, the projection is that Rwanda will reduce the fertility rate within the remaining nine years from 4.6 children (2010) to three by 2020, and reduce population growth from about 3% (in 2000) to 2.2% (in 2020). It also emerged that Rwanda has made great progress with regard to the state of health of the Rwandan population, such as reduction of HIV/AIDS and endemic diseases, although challenges remain with malnutrition and the increase of non-communicable diseases. Campaigns to eradicate malnutrition amongst children will be emphasised and also raise awareness of prevention and treatment of non-communicable diseases. The data revealed also that a focus will be put on addressing the shortage of specialised health personnel and improving the quality of healthcare, health policy while continuing the successes of homegrown solutions like the community health workers model (Republic of Rwanda, 2012c).

### **5.5.2 Transformation of higher education in Rwanda**

**Merging all public universities to form University of Rwanda (UR):** In 2013, many changes took place in the Rwandan tertiary education where MPs have endorsed a bill that seeks to have some 10 universities in the country merged to form one institution of higher learning. The Bill allows the University to develop high education quality and innovative teaching and research for addressing the problems of the population, the students, the nation, the region and globally. Law N° 71/2013 of 10/09/2013 which is a law establishing the University of Rwanda (UR) and determining its mission, powers, organisation and functioning came into effect on the day of its publication (Republic of Rwanda, 2013c).

These changes have also affected public nursing and midwifery schools. The provincial nursing and midwifery school programs have recently come under the administrative umbrella of the University of Rwanda, and College of Medicine and Health Sciences. Nursing education is provided through either a 4-year degree program at the University or a 3-year diploma of the nursing program in each one of five provincial schools. As the MOH continues to support upgrading nursing education in Rwanda, a greater number of nurses with A1 and A0 designation will be available to practice and teach as healthcare professionals in this country (Thuss, 2014).

**Establishing Higher Education Council (HEC) and determining its responsibilities, organisation and functioning:** According to the Law N°72/03 OF 10/09/2013 establishing the Higher Education Council (HEC), the primary objective of the HEC shall be to enhance quality of education, the modes of providing it within Higher Learning Institutions and to make sure that those graduating from such institutions are knowledgeable for the betterment of the welfare of Rwandan residents and the development of Rwanda HEC (Republic of Rwanda, 2013b).

According to Higher Education Council (HEC) (2013), government supports the transformation of higher education to make it fit for purpose and internationally credible. Higher education institutions are required to deliver graduates, research, consultancy services and community engagement to support the social and economic development of Rwanda. In its mandate, HEC (2014) conducted a workshop to take stock of capacity building needs in pedagogical skills for the 2014/2015 fiscal year. The following issues emerged from the workshop: (a) That academic staff be trained in the following areas: curriculum design and

instruction, pedagogical skills in teaching in higher education, student assessment and evaluation techniques, integrating ICT in teaching and learning, and assessment; (b) That the University of Rwanda College of Education needs to offer a Postgraduate Certificate in Teaching and Learning in Higher Education (PgCTLHE) to academic staff to cover the skills stated in (a) above, and adopt the following strategies for implementation of pedagogical skills trainings: setting up regional teaching centres at UR campuses, utilising blended mode of delivery to offer the training; (c) That higher learning institutions commit themselves to the implementation of pedagogical skills training for academic staff.

### **5.5.3 Transformation of nursing and midwifery education and practice**

**Establishment of National Council of Nurses and Midwives:** The National Council of Nurses and Midwives was established by Act of Parliament N° 25/2008 of 25/07/2008, promulgated 1 November 2008 (Republic of Rwanda, 2008a). The NCNM was established to regulate nursing and midwifery professions for public protection by ensuring that nurses and midwives are capable of providing safe and effective care as well as safeguarding the integrity of the profession. The National Council is an autonomous legal entity which is under the aegis of the Ministry of Health.

In exercising its mandate of regulating the nursing and midwifery professions to safeguard public interest, in conformity with Law № 25/2008 of 25/07/2008, Article One, Paragraph 4° stipulates that the National Council of Nurses and Midwives (NCNM) must determine the requirements for the approval of course programmes of nursing and midwifery and ensure its implementation. The purpose of establishing nursing and midwifery education standards is to meet the required international standards and to ensure that provider institutions have the capacity to provide and maintain a high standard of education and training that meets National and public expectations. Nursing and midwifery services as integral parts of national healthcare system need well educated and trained nurses and midwives to render quality services (Republic of Rwanda, 2008a).

**Determining the scope of practice of the profession of nurses and midwives:** Ministerial Order N° 20/25 of 18/04/2012 determining the profession of nurses and midwives (Republic of Rwanda, 2012a), highlights the importance of having skilled nurses and midwives in relation to the following issues and activities: readiness or preparedness to give an explanation or justification to relevant others for one's judgments, intentions, acts and omissions, when

appropriately called upon to do so; moral authority and attributes that enable a nurse or midwife to practice independently using his or her specialised knowledge, skills and ability to analyse a nursing/midwifery care situation, and take appropriate action while remaining accountable for that action; clinical judgment (arriving at a clinical decision after assessment of alternatives). This law indicates the scope of practice of each category of nurses and that an associate nurse (A2 level) has limited responsibilities compared to registered nurses (Republic of Rwanda, 2012a).

**Ministry of Health of 2012-18 strategic plan on education:** The Ministry of Health strategic plan of 2012-18, indicates a comprehensive transformation of nursing and midwifery education, in which nurses with A2 level need to upgrade their levels to A1 level. Because the nursing schools are small and have insufficient teaching capacity to meet an annual intake of 250 students, the capacity of teaching institutions (TIs) will be strengthened by increasing the number of TIs, expanding infrastructure, equipment and staff, and further development and training of teaching staff. And following the introduction of e-learning system in the nursing schools, the number of A2 nurses and midwives who have completed the e-learning course to upgrade their skills will increase significantly by 2017-2018. At the same time, improving and maintaining the quality of the health professionals will receive great emphasis through the strengthening of the professional bodies to monitor and evaluate the TIs for the quality of training, accreditation, and best practices (Rwanda Ministry of Health, 2012b: 58).

**Introduction of e-learning system in nursing school and midwifery schools:** It emerged that the project of introducing e-learning in nursing schools was initiated by Ministry of Health in partnership with various stakeholders, with the main purpose being to upgrade the level A2 Nurses (Diploma) to A1 level (Advanced Diploma). The introduction of e-learning schools was regarded as a national need (Rwanda HRH, 2011) and had the following objectives: to improve nurses' and midwives' knowledge and skills using modern methods of teaching and learning; to equip various health settings with well-trained and qualified nurses and midwives; to contribute to the reduction of infant and maternal mortality rate.

In a Special Report in 2013, Binagwaho, Kyamanywa, Farmer, Nuthulaganti, Umubyeyi, Nyemazi et al. (2013) stated that approximately 5000 nurses will have their qualifications upgraded from secondary-school level to three years of postsecondary school (registered nurses, or A1 level) by means of an online training platform. Improved clinical education

including an online health learning platform will connect district hospitals with university classrooms in Rwanda and in the United, and these specific time-limited targets are expected to be met by 2018. The rapid upgrading of thousands of nurses from diploma to advanced diploma required a very different model (Rwanda HRH, 2011: 151). An e-learning program was structured to upgrade a large number of A2 nurses without creating a gap in their working environment, thus providing time for face-to-face and online interaction with the teachers. A similar program for upgrading the qualification level of nurses from an enrolled nurse (EN) to a registered nurse (RN) through distance learning has been reported in Tanzania. This is the EN–RN Conversion Diploma Programme, supported by the Aga Khan Development Network, which has been offered in Tanzania in distance-learning mode since 2006 (Aga Khan Development Network, 2007).

#### **5.5.4 Partnership with other higher teaching and learning institutions (USA Universities through HRH program) to upgrade Nursing and Midwifery education**

Government in Rwanda, in partnership with US universities through the Human Resource for Health program (HRH), is working on increasing workforce numbers in nursing and midwifery, as stated in Rwanda Human Resources for Health of 2011 to 2019. A number of US universities (Duke University, Howard University, New York University, University of Illinois at Chicago, University of Maryland, University of Texas, and University of Virginia) are partnering with CMHS-UR nursing midwifery schools to carry out the upgrade.

For nurses and midwives, the HRH Program is heavily focused on raising the skill level of the workforce. The HRH Program builds on the Ministry of Health's effort to upgrade the skill levels of existing A2 nurses and midwives, as well as dramatically increasing the production of new A1 and A0 level nurses and midwives. The Ministry of Health has developed educational pathways for nurses and midwives to advance from A2 to A1 to A0 levels in an efficient sequence, raising the overall skill levels of the nursing and midwifery cadre in the country (Rwanda HRH, 2011). It emerged from the data that the Rwandan government in collaboration with HRH will increase the nursing workforce, and a total of 4,298 A1 nurses and 907 A0 nurses will be trained through the HRH program. In addition, government will dramatically increase the number of master's level nurses in Rwanda, from only 17 in 2011 to 120 by 2019 (Rwanda HRH, 2011).

According to Healey, Flint and Harrington (2014) partnership as a process of engagement uniquely foregrounds qualities that put reciprocal learning at the heart of the relationship, such as trust, risk, inter-dependence and agency. The World Conference on Education for Sustainable Development (ESD), hosted in Aichi-Nagoya in 2014 highlighted a number of crucial areas for taking the ESD agenda forward, including the importance of multi-sectoral collaboration amongst UN and other organisations, and the need to adopt an integrative view of environment-society-economy relations in ESD thinking and praxis (UNESCO, 2014). It calls on governments to review the purposes of education, the values that underpin education, and the extent to which current education models are achieving the goals of ESD (UNESCO, 2014). In doing so, it emphasises the important role that ESD has to play in building quality education for all, and ensuring educational relevance in contemporary times. It foregrounds and re-emphasizes the importance of mainstreaming ESD into all levels and phases of the education and training system, and of integrating ESD into public and community education, youth development and intergenerational learning. In sum, the Declaration sets a comprehensive agenda for ESD that is aligned with the most recent international policy directions and critical concerns (UNESCO, 2014).

## **5.6 ACTION / INTERACTION STRATEGIES**

Strauss and Corbin (1990) explain that action/interaction strategies are directed, purposeful and goal oriented measures taken in response to, or to manage, a phenomenon as it exists under a specific condition. Strauss and Corbin (1990) also explain the properties of action and interactional strategies. Firstly, they are processual and evolving in nature. This suggests that the phenomenon can be studied and described in terms of a sequence or change over time. Secondly, the action and interaction strategies need to be goal or purpose-orientated; this suggests that the interactions are in response to something and thus occur through tactics or strategies. Thirdly, Strauss and Corbin (1990) indicated that failed interaction strategies are equally important to understanding and analysing the depth and dimensions of the phenomenon. Actions that should have been taken within or under a particular circumstance, but were not taken also need to be explored to understand the implications this has in relation to the studied phenomenon.

In the context of this study, based on the analysis from different data sources, this sections describes the activities that took place during field study on the utilisation of e-learning

platform in nursing schools, and four categories emerged: (a) establishing a shared vision (e-learning as a framework to use in nursing education); (b) nature of the teaching and learning environment (campuses as providers of raw contents, campuses environment as a setting for testing a middle-range theory developed); (c) negotiating with the stakeholders and gaining their support; (d) planning effective use of a learning management system, (e) facilitation in using LMS as part of e-learning.

### **5.6.1 Establishing a Shared Vision (E-learning platform in Nursing Education)**

Establishing a shared vision was viewed as important. A shared vision helped the researcher, research team, nurse educators and other stakeholders to stay on track while working towards the common goal, and consequently to set priorities in practice development work. In the current study, having a shared vision with the participants and common understanding on the phenomenon under investigation provided necessary information and also encouraged them to take ownership of the study. Data from interviews and focus group discussion showed that the researcher provided all necessary information on what core elements were needed in the analysis of utilisation of e-learning in nursing and midwifery education.

In a study by Martin, McCormack, Fitzsimons and Spirig (2014) on the importance of inspiring a shared vision, leaders and group members indicated that visions had provided clear orientation and a strong purpose in practice. Martin et al. (2014) found in their study that clinical leaders steered practice development more systematically and efficiently if they employed strategic goals, heading towards a higher goal as articulated through a shared vision. Identification, and hence ownership, depends on the integration of teams in the developmental process of a vision (Martin et al., 2014; Pennington, Simpson, McConnell, Fair and Baker, 2013). Martin et al. (2014) argue that it was clearly easier for leaders of smaller teams to involve their teams in a bottom-up approach, meaning that the team was integrated from the very beginning into the creation of a shared vision.

### **5.6.2 Nature of the teaching and learning environment**

**The school as a provider of raw contents:** It emerged that the data used during the analysis process and development of middle-range theory was based on information obtained from the participants and from stakeholders in the College of Medicine and Health Science. The participants contributed authentic learning problems and experiences on the use of the e-

learning platform which informed the training of nurse educators on the use of Moodle and guided the development of the middle-range theory.

Aziz, Kazi, Jahangeer and Fatmi (2006) state that medical and other health professional education is influenced by the training settings where students can observe and master defined competencies that are relevant to serving in those clinical learning settings. Aziz et al. (2006) further argue that the varying health needs of different nations necessitate the development of locally adapted curricula. E-learning is reported to be the furthestmost important change to occur in nursing education since the move from hospital training to the tertiary sector. Differences in computer and information literacy for both students and educators impact positively the success of implementation of E-learning into current curricula (Button et al., 2014).

However, issues related to computer literacy are major challenges teaching institutions are facing. This is supported by the findings of this study, where participants provided information on the benefits and challenges encountered in e-learning, support mechanism in place, and facilitation of e-learning as reported from the selected school where the study was conducted. Natalier and Clarke (2015) argue the use of technology in education should be contextualised by taking into consideration the institution, the teachers and the students.

**The school environment as a setting for carrying out actions/ interaction:** In this study, the findings indicated challenges in the use of Moodle and action was undertaken to train nurse educators from the selected nursing school in order to address the problems related to poor utilisation of e-learning platform. The rationale for carrying out actions in the particular school was that the participants from the selected school provided the real problems and challenges in the use of the e-learning platform and in particular the use of Moodle as a learning management system. It was evident that the actions and interaction carried out would bring changes taking into consideration the selected school environment.

Higgins, Hall, Wall, Woolner and McCaughey (2005) present a grid which divides the complex environments and interactions within schools into different areas which can be the focus of a design-led approach to change. In the grid, learning is shown at the centre, indicating that improved pupil and school-level learning is seen as an outcome both of changes to the school's 'systems and processes' (including adoption of the design approach), and of changes to its environment or its communications approach, or to products and/or services. Placing learning

as the ‘bridging element’ also implies that changes to one area, for example the environment, are likely to be associated with changes in communication or systems and processes (Higgins et al., 2005). Higgins et al. further argue that effective communication is part of involving users and extending schools into the community. Good communication within a school seems to be part of creating an environment that is conducive to success.

**Negotiating with the stakeholders and gaining their support:** Negotiating with the stakeholders and gaining their support emerged as an important step for action/ interaction strategies for the future sustainability of e-learning. The findings indicated that e-learning at the selected nursing school was facilitated by various stakeholders; this after Moodle was down for the whole year in 2014. The researcher contacted a number of stakeholders, physically and via electronic communication. The researcher explained the purpose of the study and the importance of their collaborative participation, as the study was guided by participatory action research. The stakeholders provided useful information on Moodle and the e-learning platform in general, such as how they facilitate e-learning, problems and challenges they encountered. All stakeholders assured their support during the whole process, as it would bring a positive change in the way e-learning is done. One of the stakeholders put the researcher in contact with experts who were not on the ground. This was helpful as we continued to communicate throughout my study.

The literature demonstrates the importance of stakeholders’ involvement in any project. Higgins et al. (2005) state that different users have different views and needs, which frequently differ from the architect’s perspective. Genuine participation of users builds up individuals, produces greater satisfaction and should improve the design. Teachers’ attitudes and behaviour are vitally important to the use made of space. While there can be a dynamic relationship between environment and behaviour, it is not automatic. Environmental perceptions are not, unless prompted, often at the forefront of teachers’ planning, and staff morale is a crucial aspect of the learning environment (Higgins et al., 2005).

### **5.6.3 Planning effective use of learning management system**

The findings of this study indicated four categories in the process of planning the envisioned middle-range theory: (i) conceiving the idea of developing middle-range theory, (ii) negotiating with stakeholders and garnering support; and (iii) determining the focus of action and collaboratively establishing a shared structure.

### **Conceiving a middle-range theory (MRT) to guide the use of e-learning**

In this current study, the idea of developing a middle-range theory to guide e-learning was considered, and the shared experiences of the participants made the need for such a middle-range theory apparent. In collaborative discussions with participants they listed various problems they faced with the e-learning platform in nursing and midwifery education: inadequate training and preparation in using the e-learning platform, and in particular Moodle as LMS; low level of computer literacy of teachers and students; shortage of teaching staff for e-learning; insufficient time to finish the course (expressed by students and teachers); large number of students; not enough equipment for e-learning; breakdown of Moodle (due to unreliable electricity supply); poor use of Moodle by students and teachers; lack of facilitation of the student via Moodle; inaccessibility of internet at home and or workplace for both students and teachers; inadequate equipment for videoconferencing; lack of soundproofing in the single computer lab used for videoconferences; no motivation for lecturers who regard e-learning as an addition to their workload (rather than as added support for them); overburdened workload for students and teachers; poor library, without sufficient online books and journals; insufficient classrooms to accommodate all the students; language barriers for students (in English); financial problems when attending the face-to-face component of the course.

The problems identified by the participants related to the types of activity involved in conceiving and developing a middle-range theory. This involved an action-orientated approach, that required cooperation from all stakeholders. In addition, because e-learning is new in nursing and midwifery in Rwanda, the concept needed to be collaboratively embraced by all stakeholders so as to achieve full participation and ownership, and it also needed to be directed by a leader or facilitator who has some knowledge of the concept so as to direct and guide the stakeholders in understanding the envisioned idea.

Martin et al. (2014) found in their study that strategic direction with defined values and corresponding practical activities helped to boost quality improvement in the field. Team members experienced a shift from more traditional care to evidence-based, standardised care in their clinical practice, which facilitated them, to speak up and address outdated behaviours that they observed in others. Most importantly for the participants, the vision mediated the need for continuous development in practice as a result of working with a vision or mission statement; participants realised that change is inherent in today's world (Martin et al., 2014).

### **Negotiating with key stakeholders and garnering support**

With the intention of promoting ownership and partnership and soliciting support for a tool that would guide users of e-learning in the selected nursing school, the researcher approached the relevant stakeholders, comprising ICT managers, nurse educators, the director of the Centre for Teaching and Learning Enhancement (CTLE) at CMHS-UR, the advisor for distance and e-learning for nursing, and the administrator of the Moodle platform. They were encouraged to participate in planning and preparing for a change in the way e-learning (and in particular, the Moodle platform) was being.

The strategy of garnering support and facilitating the relevant stakeholders to take ownership in the planning process enabled the researcher to provide a platform for open discussion, which she did in the initial data collection sessions in the form of individual interviews with nurse educators and a focus group at the main campus of the selected school. Martin et al. (2014) found that vision for the project in their study provided leaders and team members with clear orientation and a strong purpose in practice. It helped them to stay on track and to set priorities accordingly, working towards common goals in the transformation of practice. Although most of the focus group participants did not talk about ‘a vision’, referring instead to terms such as ‘strategy’, ‘strategic direction’, ‘mission statement’, and ‘portfolio’, the importance of shared values and defined goals was pointed out. A common vision for stakeholders provides clarity of values and beliefs and is essential to guarantee that there is an agreed focus and targeted outcomes (Martin et al., 2014; Mayer and Carroll, 2011).

### **Determining the focus of action and collaboratively establishing a shared structure**

Collaboratively establishing a shared structure in planning was viewed as crucial to ensure the success of an effective, and meaningful nursing education program. Data from the participants indicated that there was a need to train both nurse educators and students in using Moodle as a LMS. The stakeholders and the researcher agreed, and a date was set on when the training should take place, where, what to emphasise, the duration, and how it would be conducted.

Collaboration is the extent to which people share resources and use power and authority to achieve goals they can't achieve independently (Jordan, Averett and Elder, 2000). Collaboration describes a more formal and long-term arrangement. It brings separate organisations or individuals into a new relationship with a joint commitment to a common

purpose. Such a relationship requires comprehensive planning and well-defined communication (Jordan et al., 2000).

#### **5.6.4 Facilitation of using LMS as part of e-learning (Moodle)**

The results show that designing and implementing successful teacher professional development programs in the application of technology is important for the success of e-learning. While technology increases teachers' training and professional development needs, it also offers part of the solution. ICT can improve in-service teacher training by providing access to more and better educational resources, offering multimedia simulations of good teaching practice, catalysing teacher-to trainee collaboration, and increasing productivity of non-instructional tasks. ICT can also enable in-service teacher professional development at a distance, asynchronous learning, and individualised training opportunities, and can overcome teachers' isolation, breaking down their classroom walls and connecting them to colleagues, mentors, curriculum experts and the global teacher community on a continuous basis.

In response to the difficulties nurse educators encountered in using Moodle, 15 nurse educators were invited to participate in the training workshop on Moodle. Presentations on various aspects of Moodle were made, followed by demonstration and counter-demonstration. The participants were encouraged to exercise frequently during the training. The researcher and an expert in distance learning facilitated the process.

The literature indicates that in some developing countries, ICT training for teachers is based on developing computer literacy, which is an important component for integrating ICT in education (Du Toit, 2015). However, it is noteworthy that effective training should not stop at computer literacy but should model effective teaching practices (Infodev, 2015; Du Toit, 2015). Nevertheless, there are many countries that provide little or negligible teacher training related to ICT in education. For example, evidence from Europe shows that 70% and 65% of students in Lithuania and Romania, respectively, are taught by teachers for whom it is compulsory to participate in ICT training, compared to just 13% or fewer of students in Luxembourg, Austria and Italy (Du Toit, 2015; European Commission, 2013).

The evidence on when teachers are trained to use ICT in education indicated that most seem to be trained in-service. In Africa, teacher professional development and training programmes for ICT focus on in-service teachers, but there is increasingly a shift towards the inclusion of ICT-

related training in pre-service teacher training programmes (Du Toit, 2015; Farrell et al., 2007a). Farrell et al. (2007a) add that in-service training includes face-to-face and distance-learning opportunities building on pre-service formal (accredited) training and directly relevant to teacher needs; and on-going formal and informal pedagogical and technical support, enabled by ICTs, for teachers, targeting daily needs and challenges.

#### **5.6.5 Monitoring and Transitioning phase: an awakening of consciousness**

Data sources indicated that evaluating the implementation of strategies and assessing what was accomplished is an important piece of the action strategy process. It can be done fairly simply by tracking activities and progress toward meeting objectives in the action plan. In this study, after the training of nurse educators on the use of Moodle the participants moved from a learning phase to a reflection phase. Interactional strategies and activities then became apparent which collectively constituted a transitioning phase in which the participants transitioned from being non-reflective, and learning how to reflect, to a new awakening and mindful realisation in using the e-learning platform.

In this study, the use of Moodle was monitored in collaboration with nurse educators, experts in distance learning and experts in adult education who were involved in the planning process. Moodle provided useful information which helped to inform nurse educators, and information was exchanged continuously with all stakeholders via e-mails and chatting on Moodle. Through the process of monitoring, a number of observations were made covering log reports, course blogs, notes, activity reports, course participation, activity completion, statistics, interface design of Moodle, and troubleshoots of Moodle in general. The monitoring phase was based on communication and technical assistance of nurse educators. Data from Moodle analysis indicated that some teachers have started putting in action the directions given to them during the training on how to use Moodle. Although the change was apparent, data collected indicated that not all teachers were actively engaging the students.

Farrell et al. (2007a) state that in Africa one of the biggest hindrances is a lack of follow-up in terms of technical maintenance, training, assistance, and dissemination of best practice, leading to inefficiency and inconsistency in ICT integration. This is generally due to the limited number of competent ICT trainers, in spite of regular national and regional ICT training seminars and workshops. Compared with the total number of teachers, those who sometimes manage to

integrate ICT in their classes are few and those who really master the tools and use integration properly are even fewer.

In a study on the use of Moodle, Chao (2008) concluded that Moodle was a better tool than the old in-house system, and that the switch to Moodle made possible the institution's goal of enhancing online teaching and learning. Chao stresses the importance initially of an effective change agent within an organisation. Adequate thought, planning, and time must then be allocated to all the elements of the project. Change management strategies should be drawn up to deal with the following issues: becoming an effective change agent (as a unit and as a staff member); supporting faculty and learners in adapting to the change in LMS; communicating continuously about the changes; maintaining quality throughout the drastic changes in technology and processes; monitoring progress and assessing success or failure (Chao, 2008).

## **5.7 INTERVENING CONDITIONS**

### **5.7.1 Facilitative Intervening Conditions**

The sub-categories which emerged as facilitative conditions were: (a) institutional support for teachers and students, (b) partnership and collaboration, (c) policies and guidelines of e-learning, (d) effectiveness of learning management system (Moodle), (e) e-readiness, and (f) bridging the digital divide.

#### **5.7.1.1 Institutional support for teachers and students**

In this study, it emerged that the success of e-learning depends on institutional support for teachers and students. The strategic approach to the development of e-learning, while recognising the opportunities for students in general, brings particular benefits for distance-learning students through its ability to provide support in an increasingly coordinated way. Data from this study indicated that technological material resources, technical support, and well-trained nurse educators were pivotal to the success of e-learning. It was found that the institution facilitated the process of developing modules at each level of the program. Support ranges from technical support from ICT managers who assist both teachers and students when there is a problem of the network, computer problems or access to Moodle. Data indicated that the institutions were equipped with ICT laboratory, (wireless) internet on campus accessible to both teachers and students, videoconference equipment, projectors, and electricity, and that

currently Moodle is stable, compared to the past, and each computer laboratory from each campus is equipped with computers. Data also indicated that the institution provided modems and airtime to teachers during teaching periods.

These results corroborated quantitative findings regarding the institutional support provided by the school; it was found from the ICT managers from two campuses that institutions had a suitable equipped ICT laboratory with computers and internet, portable laptops on request, whiteboard, video and audio equipment, video cameras, and video conference equipment as indicated in chapter 4.

Participants reported that they had been given training in ICT but regarded the training as insufficient. It emerged that a positive environment was in place for the e-learners and teachers in an e-learning system. For nurse educators, the e-learning environment helped them to increase their knowledge both pedagogical and technical. These findings corroborated the quantitative findings where nurse educators reported having institutional support in using ICT in teaching. The support received ranged from compulsory ICT training to pedagogical and technical support. In the findings, 63.6% of nurse educators reported that it was compulsory to participate in ICT training. Regarding the locations where nurse educators undertook professional development, 77.3% reported personal learning about ICT in their own time; 56.8% reported introductory courses on Internet use and general applications (basic word-processing, spreadsheets, presentations, databases, etc.); 52.3% reported ICT training provided by school staff; 50.0% reported courses on the pedagogical use of ICT; 47.7% reported other professional development opportunities related to ICT; 40.9% reported subject-specific training on learning applications (tutorials, simulations, etc.); 38.6% reported professional discussions with other teachers; 29.5% reported advanced courses on applications (advanced word-processing, complex relational databases, virtual learning environment etc.); 22.7% reported courses on multimedia (using digital video, audio equipment, etc.); 20.5% reported advanced courses on internet use (creating websites/home page, video conferencing, etc.); 20.5% reported equipment-specific training (interactive whiteboard, laptop, etc.); 20.5% reported participating in online communities (e.g. mailing lists, twitter, blogs).

The findings indicated various sources from which participants received support: a more experienced/knowledgeable teacher; school ICT coordinator; other school staff; experts from outside the school; an online helpdesk, community or website. The support was mostly

technical support, mostly pedagogical support, or both technical and pedagogical support. According to McCarthy (2014), successful e-learning for nurses is facilitated by experienced nurse tutors who maintain a strong online presence and organise communities of practice through discussion forums and chat rooms. If online learning is to be successful in nurse education, attention must be paid to the design of the learning programmes concerned. Managers need to ensure that staff are satisfied with the programme content and the methods employed, and that attrition rates from programmes are not increased through studying online (Salmon, 2004 cited in McCarthy, 2014).

According to EMPOWER (2016), which is a project carried out with the support of the European Commission, the Directorate-General for Education and Culture (DG EAC), under the Erasmus+ programme, the flexibility of the learning service offered by e-learning allow students to learn without being restricted by time and space. Technological tools such as learning management systems create a conducive learning environment for students (EMPOWER, 2016). Learning environments in blended learning accommodate many students, and adapt various teaching styles based on the learners' ability, and teachers' skills to work in a hybrid learning system (EMPOWER, 2016). Ilomäki (2008) argues that learning should be organised in authentic settings, because students need to learn more than just abstract concepts and self-contained examples, they also need to learn to use the conceptual tools of the domain in an authentic activity.

Institutions must develop ICT support services to proficiently deliver media-intensive learning in an inexpensive way, and to support daily e-learning facilitation for both teaching staff and students. It is essential to access to a wide range of digital resources, and to improve the digital literacy of the users (EMPOWER, 2016). ICT support is imperative to use digital devices, and respond to the issues of internet connectivity and software. Supporting people with disabilities in a technology driven environment ensures social inclusion at all academic levels (EMPOWER, 2016; Allan and Clarke, 2007). Bates (2014) states smart educators and trainers need to look at how they can design model that facilitated learning in the evolving technological world, particularly for lifelong learning.

#### 5.7.1.2 Partnership and collaboration

In this study, the findings indicated that the Rwanda initiative to partner with other higher learning institutions and other countries in the field of education and the health sector has been

fruitful. In particular, the partnership with the Rwanda Human Resources for Health (HRH) has been fundamental to nursing education, and above all in establishing e-learning in nursing and education in partnership with the Ministry of Health in a twinning model where US educators partner with their Rwanda counterparts. Goals are set depending upon the departmental needs, personal interests, and the competencies of the respective twins.

This HRH program has enabled Rwanda to attract high calibre faculty from the US Institutions (USI) including those with masters and doctoral degrees. Their collaborative mentoring and teaching have made significant inroads and helped to improve the education of nursing and midwifery students and clinical care for Rwandan patients (Mukamana et al., 2015: 11). There are two categories in the HRH faculty: leadership, management, and strategy (LMS) and clinical educators (CE) (Mukamana et al., 2015: 11). All of these faculty members provide expert guidance and teaching in their designated areas. Their efforts are geared towards capacity building of Rwandan faculty and practitioners by mentoring, teaching, training, and providing various learning experiences for Rwandan nurses and midwives (Mukamana et al., 2015: 11).

#### 5.7.1.3 Policies and guidelines

Data sources indicated the effective integration of ICT in national education systems requires policy and guidelines measures to be established. Policy puts ICT in context and motivates teachers to make adequate use of the technology and more generally to bring about change. The policy regarding the e-learning in nursing education in Rwanda determines the duration of face-to-face and online instructions. Face-to-face instruction accounts for 40% of the academic year while online instructions and self-directed learning account for 60%.

Objectives of the ICT policy of the Rwanda Ministry of Education include building a common shared understanding and synergy for what ICT in education means among all stakeholders, creating an enabling environment, mechanisms and priorities for ICT in education, development of modern, relevant content fulfilling the needs and expectations of citizens, industry, and society in general, harmonisation between centralised and decentralised levels of the education system, leveraging public-private partnerships and support of development partners, and strengthening Rwanda's effort to export models for ICT in education to Africa in general and to the EAC and COMESA in particular (Rwanda Ministry of Education, 2016).

#### 5.7.1.4 Functionally effective learning management system (Moodle)

Data from participants, document analysis and Moodle platform indicated that Moodle was the learning management system used in Rwanda. Moodle serves as a learning platform, which is a set of interactive online services that provide students with access to educational resources to facilitate educational delivery and management. Moodle promotes a collaborative approach and helps teachers design online courses with an emphasis on communication and teamwork. Many components of the courses spread its functionalities, such graphical themes, authentication and enrolment methods, games and activities, and resources.

According to the FAO (2011), a number of teaching organisations use learning management systems to offer and manage teaching programs, through internet. There are a diversity of learning platforms with different levels of complexity (Horvat, Dobrota, Krsmanovic and Cudanov, 2015; FAO, 2011). The learning management system used in Rwanda is Moodle. The FAO (2011) notes that the use of Moodle encourages a collaborative approach. An LMS such as Moodle supports delivery and management of all learning delivery, including online, virtual classroom and instructor-led courses. It automates the learning course and easily delivers training, manages learners and keeps track of their progress and performance across training activities (Horvat et al., 2015; FAO, 2011).

#### 5.7.1.5 E-readiness of institution, teachers and students

Mercado (2008) emphasises the importance of online learning readiness of the institution in addition to the online readiness of learners and teachers for implementation of an e-learning environment. According to Khan (2005), readiness assessment helps to review the comprehensive readiness status of an institution's e-learning initiative and it also points to critical factors that should be considered in order to get ready for e-learning. Open, flexible and distributed nature of e-learning environment requires that we review the status of readiness in all possible domains. E-learning readiness is essential to support the successful of E-learning implementation in higher education (Budiharto, Rohayani, Kurniabudi and Sharipuddin, 2015).

It emerged from this study that institutional readiness, student readiness, and teacher readiness are interrelated, and if one is missing or is inadequate, e-learning becomes problematic. Institutional e-readiness (readiness to benefit from educational technology) involves the ability of the institution and the capacity of institutional stakeholders (managers, key ICT persons,

teachers and students) to generate e-learning opportunities by facilitating computer-based technologies. The nurse educators' e-readiness depends on their preparedness, knowledge and skills (as themselves being e-learners) to use instructional and technological design in their daily activities. E-readiness for nurse educators is also concerned with ease of using technology, and with necessary investments in infrastructure, but also assumes a degree of administration support of e-learning. It is also important to be educationally ready to use e-learning, with nurse educators being motivated and having undergone adequate training. The motivation might come through incentives or other forms of recognition of the job done, as many consider the use of technology as an extra task, and overall nurse educators' readiness is about the teaching styles and the educational needs satisfaction.

The study found that nursing students need to be prepared to adopt e-learning and benefit from its advantages. E-learning-readiness for students needs to be determined before teaching institutions introduce e-learning. Student readiness involves the ability to adapt to technological challenges, collaborative learning, and synchronous and asynchronous self-paced learning, together with the necessary motivation and discipline to learn in a self-driven mode and to respond to online instructions. It also involves the availability of infrastructure, clear training objectives, trainer support and guidance, and knowledgeable leadership. The literature indicates that academics also need to understand that the teaching and learning strategies that apply to traditional classroom learning differ from those that apply to online learning. The change in job requirements for e-learning means that academics at higher education institutions must acquire new skills to teach online and also learn how to use online resources and tools to enhance the learning experience and facilitate communication so that learning can take place (Ilgaz and Gülbahar, 2015; Budiharto et al., 2015; Vermeulen, 2011).

Individual properties, ICT competencies and motivation, together with access to technology, are identified as crucial aspects for e-readiness (Ilgaz and Gülbahar, 2015; Budiharto et al., 2015). Satisfaction of online students is one of the significant factors that guides the design, delivery and implementation of e-learning and undoubtedly have an impact on the quality of education (Ilgaz and Gülbahar, 2015). High-quality Web bases learning courses offer outcomes such as lower costs for students, learning institutions, while achieving learning objectives (Budiharto et al., 2015; MacDonald et al., 2001). Learning outcomes also include personal benefits for the student, because there is no personal stress of losing the job, moving away from one's family, and financial challenges. This in return facilitates students to be committed to

their studies and gain new knowledge and skills in their working environment, and enhance the quality of services delivered by them (Maneschijn, 2005; MacDonald et al., 2001).

In this study, the findings from the participants indicated that nursing students and nurse educators make use of information technology in order to communicate via e-mail, to conduct research and to conduct scholarly writing, they actively make use of online learning in their teaching, and place or collect assignments on the internet in learning management system (Moodle). Participants noted that it was an open system in which it was easy to access information and do research. ICT, and in particular e-learning, was reported to increase the critical thinking of the students. The participants had a shared vision and realised the importance of e-learning in nursing education.

These qualitative findings corroborated quantitative results in this study, in which 90.7% of nursing students reported that the internet was very important in their lives, 97.7% reported using computer and/or internet to prepare and to teach lessons, 52.3% reported using the internet in more than 75% of all lessons, 22.7% reported doing so between 71 and 50%. In addition, both campus managers who participated in this study, used computers for school management-related tasks (budgeting, planning, timetabling, etc.); searching for information; making presentations.

Given the rapid growth of ICT, it has a great impact to both personally and professionally development (de Wet and Koekemoer, 2016). The literature indicates perceived usefulness as the most significant factor of behavioural intention to use the technology (Jiang, Chen and Chen, 2016; Umrani-Khan and Iyer, 2009; Legris, Ingham and Collette, 2003). Acceptance of e-learning comprises acceptance of technology, but differs in some key respects as the pedagogical aspects need to be considered (Umrani-Khan and Iyer, 2009). Studies of e-learning technology acceptance have tested the technology acceptance model, on teachers (Yuen and Ma, 2008; Nanayakkara and Whiddett, 2005) and on students (Keller, Hrastinski and Carlsson, 2007; Masrom, 2007). These studies provide evidence for the importance of attitudes in acceptance of e-learning.

Availability and accessibility to the computers and the internet to the users are considered to be driving forces for the success to e-learning. According to Évora (2004), in nursing the internet can be used as a tool for research in accessing available resources. Special attention should be given to search sites, electronic mail, database access, forums and discussion lists,

transfer of files (FTP), homepages and videoconferencing. It is concluded that the Internet is a valuable resource in seeking information for answers to nursing problems. The computer allows the person to easily find every type of information. When the information is on-line, an appropriate search can recover the information that is needed much faster than when accomplished manually (Talebian, Mohammadi and Rezvanfar, 2014; Évora, 2004). Similarly to the findings of this study, Kader (2007) found in his study that respondents used the internet mainly for communications, including communication with their teachers and colleagues. Kheswa (2010) are required to use internet for course-related activities and administrative functions.

#### 5.7.1.6 Bridging the gap of digital divide

**Political commitment:** Document analysis indicated that the government in Rwanda recognises the digital divide in ICT and access to the internet, and is trying to bridge the digital divide. In this area, the findings reveal that Rwanda has made an enormous progress in the areas of ICT guided by its Vision 2020. In the framework of implementing Rwanda's Vision 2020 that focuses on transforming Rwanda to a knowledge economy, government initiated the National Fibre Backbone project in 2008 with the target of putting in place connectivity and adequate broadband communications facilities across the country. Data indicate that the government of Rwanda has initiated a number of projects such as E-Rwanda, and this project has the objectives to achieve its target through the use of ICT. The Government of Rwanda is encouraging traditional media to bridge the knowledge divide and to facilitate the flow of cultural content, particularly in rural areas (Republic of Rwanda, 2012c). In the digitalisation of the country, the Government of Rwanda came with some innovations in education rarely seen in the region such as ICT buses, telecentres, Public Information Kiosks, National ICT Literacy and Awareness Campaign Initiative, a digital public library and archive services (Republic of Rwanda, 2015a).

Data indicates that this partnership and collaboration with other higher learning institutions is one of the essential elements of Rwanda Vision 2020, with government stating that in the field of education it will continue to upgrade skills on a large scale, e-learning in nursing education clearly being one example. Partnerships initiatives were also highlighted as a necessity in education, particularly in relation to importing technologies from developed countries (Republic of Rwanda, 2012c: 11).

Internet and Moodle access is currently stable due to the partnerships, and with electrification of rural areas, there is a hope that internet penetration will increase, as companies providing the internet are increasing performance and accessibility in remote areas with a high-speed Internet 4G, although it is currently limited to some few areas and is costly; and according to document analysis, the cost of the internet in general is still high. Participants in this study suggested a reduction of internet cost in general, and reinforcing accessibility of the internet and of Moodle as a learning management system; some participants also suggested the provision of financial assistance for internet access. In relation to electricity supply being one of the obstacles to internet/Moodle access at the selected nursing school campuses, document analysis indicated a Vision 2020 target to increase electrification in rural areas and increase electricity supply overall – giving hope that problems of power disruption will no longer affect internet access and extension of computer literacy (African Development Bank Group, 2013; Republic of Rwanda, 2012c).

**Early socialisation to IT:** It surfaced from this study that Rwanda has made a huge progress in socialising Rwandans to the use of IT. Government has set a target of transforming Rwanda into an ICT-literate nation and reaching 50% computer literacy by 2018 for the population aged 15 and above, and raising awareness and increase use of existing and future ICT-enabled information and services for at least 60% of the Rwandan population aged 15 and above by 2018. In addition, the One Laptop Per Child program (OLPC) launched in June 2008 seeks to provide access to laptops for all students from P4 to P6. The OLPC project was set to receive 100,000 more laptops in a bid to ensure that all 416 administrative sectors in the country have an OLPC-enabled school, and the project has seen about 80,000 laptops distributed in 145 schools countrywide (Kanyesigye, 2012).

In the process of reducing the cost on books and other printed materials, government is considering digitising learning materials through its ‘Smart Classroom’ initiative (Mark, 2015), which, according to the Minister of Education, will also ensure that students across the country can easily access same learning materials (Mark, 2015). Recently one laptop per student has been initiated in tertiary education by the University of Rwanda at Huye campus, and it is expected to expand in others campuses in the programme of Smart Rwanda (Tuyishimire, 2016). A lot of progress has been made in mobile and internet banking, and many of the local newspapers can also be found on the internet. It emerged from the document analysis that with a large number of people speaking Kinyarwanda, Windows 8 in Kinyarwanda is being

implemented and this will assist in building ICT literacy in the country and spreading ICT usage to a large number of the population (Republic of Rwanda, 2015a: 32). There is a significant increase in the use of computers in both public and private sectors. The culture of using computers is higher than ever before. In order to meet the changing demands of the economy, Rwanda has focused on improving its human resource capacity (Republic of Rwanda, 2015a: 16).

**Emotionally mature students:** In the initiative to upgrade diploma level (A2) nurses, to advanced diploma (A1) level with the help of e-learning, the average age of the nurses involved was 36 years, in an overall age range between 28 years and 50 years. Teaching mature students required a different approach that is student-centred which is self-directed learning, collaborative learning, inquiry-based learning, interactive learning, and integration of the theory into practice. It emerged that those who were enrolled in that e-learning found it interesting because it helped them to become familiar with ICT and English language, and they continued to work, supporting their families while accessing the teaching and learning resources either in their respective places of work or in their homes. Regarding the age of the participants enrolling in e-learning in nursing education, nurse educators indicated that they do all they can to integrate them in the e-learning system. These digital immigrants were facilitated through training, though they reported being very difficult, and e-learning facilitation takes that into consideration.

Prensky (2001) argues that the gap between digital natives and digital immigrants is the fundamental cause of the alleged "decline of education in the US," and he contends that our current educational system has not been designed to serve today's students. According to Prensky (2001), the solution is for today's educators to learn the language of the natives, to speed up instruction, and to provide random access. Prensky argues for a new way of looking at educational content as well. The rapid pace of change is undeniable, and it is likely that generations growing up amidst such change will be amazingly adaptable. Good teaching engages learners' interests. However, good teaching also aims to improve students' ability to engage in higher-order thinking; it recognises the diversity of learners' abilities and needs, and it reflects an awareness of both the complexity of the learning process and the need to make adjustments in different circumstances. Human teachers do not always accomplish all of these tasks at once, or any one of them consistently. Even so, there has yet to be a computer program that can come even close to replicating what a human teacher does on a daily basis. Rather than

focusing on the development of computer applications that teach. Creating better tools for teachers, and then helping them become better users of those tools regardless of the age of the students (VanSlyke, 2003). In this study, it emerged that with Rwanda Vision 2020 and government partnership with various stakeholders, the digital divide will be bridged and all nursing students and nurse educators will enjoy the benefits of e-learning; the ultimate outcome will be quality education, the provision of quality services, and increasing the number of nursing workforce in a short period taking into account the context of the health sector in Rwanda.

### **5.7.2 Inhibiting factors for e-learning reported by participants**

Although the e-learning was positively perceived, a number of hindrances in its use emerged: (a) Resource constraints; (b) Insufficient ICT literacy (computer/ internet/ Moodle); (c) Challenges with the language of instruction; (d) Generational age gap (e) Lack of policies regarding e-learning; (f) Resistance to change; (g) Issues of Moodle interface design.

#### **5.7.2.1 Resource constraints**

The findings indicated that resource constraints were hindrances to the utilisation of e-learning. Constraints reported by participants were: insufficient infrastructure, shortage of staff, work overload/time constraint, poor motivation, financial problems, and inaccessibility of Internet/website/Moodle. It emerged from data sources that there was insufficient infrastructure to accommodate regular and large numbers of e-learning students; problems cited were: classrooms, poor library without sufficient online books, no expansions of the buildings such as ICT lab and skills laboratory, and no computer for all students. From the field notes of the researcher, it was observed as well that at most campuses where the study was conducted there was no expansion of classrooms, library or ICT laboratory and skills laboratory. Adequacy of infrastructure was associated with the success of e-learning. The findings showed that substantial effort should be put into infrastructure. According to Alkharang and Ghinea (2013), there is a great necessity to meet the challenges posed by the development of information technology and its potential for greater access to knowledge. Rhema and Miliszewska (2010) and Kundi, Nawaz and Khan (2010) state that in most developing countries use of ICT and implementation of e-learning are still at an early stage.

The literature indicates that ICT equipment is quickly evolving technologically, making it difficult for school administrators to make informed and sustainable choices regarding which devices to use. Moreover, this rapidly evolving digital landscape creates additional challenges in preparing teachers to integrate ICT in their teaching (Du Toit, 2015; Twining and Henry, 2014). The UNESCO Competency Framework for Teachers advocates that teachers need to know basic hardware and software operations, and be sufficiently flexible to use a variety of subject-specific tools and applications (UNESCO, 2011b). If teachers are not exposed to this variety of ICT facilities and devices, confidence in making use of the devices may be compromised. In developing new indicators, it might be important to go beyond those measuring usage of ICT in education in general, opting for indicators measuring the use of different types of ICT tools. Countries have a variety of combinations of ICT tools available to them in schools (Du Toit, 2015). However, given the infrastructural difference between urban and rural areas in many developing countries, measuring types of ICT used is relevant, as the needs of countries with a high urban student population are different from those where more students reside in rural areas. However, infrastructure in many countries is weak and this affects usage (Du Toit, 2015).

Data sources from this study indicated that shortage of the staff was associated with excessive workload, and was found to have a huge impact on teachers' motivation and morale. In this study, work overload was reported by teachers, by students and by ICT managers. Data from this study indicated that to perform well in their teaching activities, teachers need to be motivated, and that many factors can affect their motivation, including the nature of the school infrastructure, salary, recognition, professional status, achievement, advancement, further training, relations with others, school leadership and policies, working conditions, recruitment, deployment, and many others. Study participants reported that there was no motivation for teachers despite the excessive workload, extra working hours, and teaching bigger numbers of e-learning and regular students. It emerged from this study that teachers' working conditions and environment, if not supportive, reduces their motivation and commitment to teach. If teachers have low levels of job satisfaction and are poorly motivated; students are not well taught and thus don't receive a minimal acceptable education.

The literature indicated that in Africa teachers are often reluctant to embrace ICT because they are already overloaded with very busy timetables and large classes. Real ICT implementation requires more equipment and more timetable organisation and alleviation (Farrell et al., 2007a).

It is apparent that more time is needed and more incentives are required to change the mentality and attitude of education stakeholders so that they embrace the changes brought about by new technologies and engage fully in innovative and creative new approaches (Farrell et al., 2007a).

In the data, short staffing, causing work overload, was also reported to be a serious challenge to e-learning. The introduction of e-learning was not accompanied by any increase in the number of teachers and those assigned to teaching via e-learning found themselves also teaching regular students. Need for adequate numbers of trained staff was reported as crucial. The findings from this study indicated three areas of particular importance for e-learning infrastructure: course management systems, well-equipped classrooms and computer labs, and computer access for students and teachers. Data sources indicated that students' computer labs were an extremely important component of e-learning programs. Intensifying e-learning program enrolment drives student demand for computer access, resulting in overcrowded computer labs because current facilities may be too small and too few in number.

Data from this study indicated that a basic requirement for online e-learning is access to a stable internet connection and dependable computer. Participants in this study indicated that lack of Internet network and access to Moodle were problems for a number of participants, which led to poor facilitation and inability to do online activities as required. It emerged that at a certain point Moodle was out of action for a year due to various problems and had to be relocated, where it is currently stable and working well – although Internet access problems and electricity disruptions still create difficulties for participants using the Moodle platform, teachers are not trained in how to incorporating e-learning into their teaching methods, and students lack appropriate access to the internet outside educational institutions to make e-learning practicable at this stage.

Data sources from this study indicated how academics are placed in relation to the pastoral wellbeing of their students. Students often face an uncomfortable transition from supporting themselves to being a student. For many students, it has been crucial in making the training possible. Data sources revealed that nursing is a career that has not only experienced extreme growth in terms of demand, but has also reached a point of crisis in some locations due to a shortage of qualified individuals to fulfil the needs of the community. These extremes create a strong need for the provision of financial assistance by government entities to encourage more

people to seek careers as nurses. The findings revealed that in recent years, lack of funds to support the students has been reported as a hindrance to e-learners.

Quantitative results from this study corroborated the problems for both nurse educators and nursing students which have been reported in qualitative data. Nurse educator participants encountered problems in using ICT in teaching and learning: 81.8% reported insufficient internet bandwidth or speed; 81.8% reported insufficient technical support for teachers; 81.8% reported insufficient pedagogical support for teachers; 81.8% reported lack of pedagogical models on how to use ICT for learning; 77.3% reported lack of adequate skills of teachers; 75% reported insufficient number of internet-connected computers; 75% reported pressure to prepare students for exams and tests; 72.7% reported insufficient number of computers; 72.7% reported too difficult to integrate ICT use into the curriculum; 72.7% reported school time organisation (fixed lesson time, etc.); 70.5% reported lack of adequate content/material for teaching; 70.5% reported school space organisation (classroom size and furniture, etc.); 65.9% reported lack of content in national language; 65.9% reported most teachers not in favour of the use of ICT at school.

Regarding nursing students, it was found that they also encountered a number of problems in using the internet on campus: 63% reported very slow internet connection (takes too long to load pages), 35.2% reported restricted access to certain networking sites; 22.5% reported very few internet-connected computers; 21.1% reported very little training offered to students in the use of the internet facilities. This is in line with the findings from two ICT managers who participated in this study who indicated that internet speed is between 10mbps (excl.) and 30mbps (incl.) which is slow and may limit access to certain resources. Furthermore, nursing students also reported other problems they encountered: 58.6% reported encountering sites that want the participants to pay to access information; 49.8% reported sites that require participants to register with them; 30.4% reported that it takes too long to view/download pages; 30.4% reported sites that are not compatible with all browsers.

While distance education holds promise, a number of hindrances have to be addressed before it can be entirely exploited in Africa. There are a number of technological problems that hinder distance education. Infrastructure outside of major cities remains inadequate (Nyerere, Gravenir and Mse, 2012). Similar findings were also reported in a study by Kisanga and Ireson (2015) where participants reported the problems related to infrastructure including inconsistent

electrical power supply, insufficient internet connectivity (bandwidth capacity) and inadequate computer laboratories and computers or the internet is slow, the problem of power was reported as well. Connectivity outside major capital cities causes a potential challenge in designing a national distance education program. Furthermore, there is also the lack of a trained professionals to facilitate the implementation of distance education (Nyerere et al., 2012). In a study conducted in Zimbabwe, it was found that a majority of the lecturers (97.5%) facilitating open distance e-learning have no experience in distance education (Mpofu, Samukange, Kusure, Zinyandu, Denhere, Ndlovu et al., 2012). Effective use of distance learning technologies requires the training of the teaching staff in using ICT in education. To date, few African teachers are used to facilitation in an e-learning environment. This has become a hindrance in introducing distance education on the continent (Mpofu et al., 2012). A National Education Association (NEA) survey in the United States reported that teaching staff main issue in e-learning was extra work that is not catered for in terms of salary increment, or extra compensation (Nyerere et al., 2012; National Education Association, 2000).

#### 5.7.2.2 Insufficient ICT Literacy (Computer, Internet, and Moodle)

In this study, it surfaced that e-learning requires more than just access; the student's teachers and the administrative and technical support staff for the e-learning environment must also have the necessary technology skills to make them ready to venture into e-learning. This involves basic computer skills, online skills and computer application literacy. Success in an e-learning world demands new forms of literacy and expertise of students. Data emerging from this study revealed that some of the inhibiting conditions to e-learning may be regarded as digital divide; these relate to **insufficient training of students and teachers** in using computers, Internet, and Moodle for teaching and learning in e-learning platform, frustration of teachers and students in the use of these technologies, and difficulties in accessing academic-related materials. Data from this study indicated that inadequate ICT literacy led to inadequate online facilitation of the students by teachers, and to both teachers and students being unable to derive maximum benefit from e-learning.

These findings corroborated quantitative findings that in the past two years a significant number of nurse educators had not undertaken any professional development, which was vital to the use of the e-learning platform. Of 44 nurse educators, 79.5% did not receive an advanced course on internet use (creating websites/home page, videoconferencing, etc.); 79.5% did not

receive an equipment-specific training (interactive whiteboard, laptop, etc.); 79.5% did not participate in online communities (mailing lists, twitter, blogs, etc.); 77.3% did not receive a course on multimedia (using digital video, audio equipment, etc.); 70.5% did not receive an advanced courses on applications (advanced word-processing, complex relational databases, virtual learning environment etc.); 61.4% did not have professional discussions with other teachers; 59.1% did not receive subject-specific training on learning applications (tutorials, simulations, etc.), 52.3% did not receive any other professional development opportunities related to ICT; 50.0% did not receive courses on the pedagogical use of ICT in teaching and learning; 47.7% did not receive ICT training provided by school staff; 43.2% did not receive introductory courses on internet use and general applications (basic word-processing, spreadsheets, presentations, databases, etc.).

The findings from this study indicated that challenges in the use of ICT tools by students caused frustration among nurse educators, with some of them teaching only face-to-face for courses that were supposed to be taught in a blended mode. Nursing student participants reported that more time was needed for learning to use computers and the Internet, and nurse educators, from their side, felt that students at the selected school didn't have enough Moodle packages. The literature indicated that the use of ICT can bring frustration among students and teachers (Adegboire, Adeniji and Adeshina, 2015; Mbaba and Shema, 2012). Mbaba and Shema (2012) stated that the limited use of technology for research was not only due to lack of facilities but also due to students' knowledge skills, beliefs and expertise, student needs more training not only in computer literacy but also coherent strategies to enable students fully integrate ICT as pedagogical tools even in the classroom.

With the introduction of e-learning in nursing schools in Rwanda a number of challenges have been noted including the use of computers, internet, and ICT equipment by nursing students and nurse educators (Munyemana, 2012). Hallila, Al Zubaidi, Al Ghamdi, and Alexande (2014) state that computer and internet literacy are important skills for nursing students. In their studies, they need to use the computer and the internet to find information from websites and be able to use various software. Computer and internet literacy helps student nurses to achieve their learning goals and the skills required are also important for their future career. The literature also indicates issues relating to computer literacy, information literacy and e-learning facilitation which hinder the advancements of nursing students and nurses in general (Button et al., 2014; Capdeferro and Romero, 2012; Tohm, 2012; Turker et al., 2006; Barnard et al.,

2005; Childs et al., 2005). Despite its high profile, e-learning is not straightforward and very often raises issues (Childs et al., 2005).

A study by Nyerere et al. (2012) demonstrated that most (68%) of the teaching staff who facilitated e-learning courses had not been given special training. These findings are similar to those of Mpofu et al. (2012), who noted that 97.5% of e-learning teachers in Zimbabwe had not received relevant training. Similar issues have been reported at the University of Nairobi Centre for ODeL. The majority of these lecturers felt that it would be vital for them to be trained in e-learning facilitation approaches (Nyerere et al., 2012). According to Assareh and Bidokht (2011) attention should be paid to instructors and their capacity to facilitate online learning. Furthermore, there is a need to put in place infrastructures and the equipment needed for designing and delivering the courses (Assareh and Bidokht, 2011).

### 5.7.2.3 Challenges with the language of instruction

**Historical context of Language of Instruction:** Data emerging from this study indicated that English as the language of instruction or academic language was a challenge for those enrolled in the e-learning system. From document analysis, it was found that problems in using English have their roots in the colonial area. It was found that Rwanda was colonised by Germany and later Belgium. The language of instruction used during Belgian colonisation was French. Throughout the 1960s, the extremist government launched vicious attacks on Rwanda's Tutsi population, resulting in a mass exodus into neighbouring Burundi, Tanzania, Uganda, Kenya and Congo (Republic of Rwanda, 2008b). Exiles in other countries who had a chance to study were required to do so in various different languages; for example those who fled to Anglophone countries found themselves studying in English and those who fled to Francophone countries found themselves studying in French. Within the country, during the First Republic and the Second Republic, there were two official languages, Kinyarwanda and French, and French continued to be the language of instruction in tertiary education (Republic of Rwanda, 2008b). Data sources revealed that English was introduced as an official language after the 1994 genocide against the Tutsi, becoming the third official language along with Kinyarwanda (mother tongue) and French. The evolution of Rwanda's language policies since 1996 has played and continues to play a critical role in social reconstruction following war and genocide. Rwanda's new English language policy aims to drop French and install English as the only language of instruction (Samuelson and Freedman, 2010).

### **Unpreparedness to use English as a language of instruction for mature-entry students:**

Emerging from the data sources, the use of English as a language of instruction was a challenge for mature-entry nursing students, the language of instruction (LOI) being the language in which subject matter is taught in a public or private school setting. It emerged from various data sources that mature-entry students, in particular those who had been trained in a francophone system, faced challenges in using English as the language of instruction, especially at the beginning of their advanced diploma program. Some of the participants indicated that they sometimes use Kinyarwanda or French for a fuller understanding.

The data sources indicated that the role of Kinyarwanda, as a mother tongue, in supporting English as LOI could not be ignored, in particular during group work and clinical accompaniment by nurse educators and clinical mentors. A common language among learners has a potentially important mediating role to play in facilitating learning and in supporting collaboration in learning. Failure to explain in Kinyarwanda (for example, with some expatriate lecturers who do not know Kinyarwanda) resulted in less understanding of the subject matter during lecture time and required extra practice and mentorship sessions where students would repeat the same course among themselves in Kinyarwanda during their private study time.

These challenges, rooted in the history of Rwanda, encountered by nursing students in using English as a language of instruction were considered as an element in the digital divide as already highlighted in this study. After the 1994 genocide against the Tutsi, English was introduced as the 3rd official language in Rwanda, after Kinyarwanda and French (Republic of Rwanda, 2008b). The Rwandan government is justifying the switch to English as a medium of instruction by pointing to the global and regional growth of English as the leading language of science, commerce and economic development. The government states that greater prosperity will contribute to national reconciliation by improving living standards and life opportunities for all Rwandans (Samuelson and Freedman, 2010). In the trilingual Rwanda of 1996-2008, advanced primary and secondary students were able to use English or French as their primary language of instruction, and take Kinyarwanda and the other language as subjects. Students entering the university were expected to do academic work equally well in both English and French. This official plan, however, was far from the reality of an educational system struggling to recover from the devastating losses of teachers, materials and buildings (Samuelson and Freedman, 2010).

The language of instruction (LOI) is defined as the language in which subject matter is taught in a public or private school setting. The second language has traditionally been used in different contexts and can mean (a) the second language learned (chronologically); (b) the weaker language; (c) a language that is not the mother tongue; or (d) the less used language (Plonski, Teferra and Brady, 2013). Most recently Rwanda, long a French-speaking country, has switched to English as an official language. Burundi and Gabon are switching from French to English, and South Sudan is adopting English (Plonski et al., 2013), and the power of the English language is seen in the political, economic and educational spheres of the global stage (Plonski et al., 2013). A common working language is a requirement for that cooperation. Furthermore, as developing countries seek to compete in the global marketplace, English is the language in which most negotiation and marketing schemes must take place. English is also the primary language of academia, as the majority of academic publications are written in English (Negash, 2011). Scholars emphasise that access to knowledge is the business of education (Plonski et al., 2013).

In relation to the digital divide, language has become a barrier, now that globalisation, a phenomenon which has twisted the world into a global village, supports educational interaction and collaboration amongst teaching institutions, irrespective of the time and space (Roets and Maritz, 2013). Globalisation, therefore, has had a profound effect on developing open and distance learning (ODL) systems (Biao, 2012). According to Plonski (2013), English has become the second language of everybody. It has gotten to the point where almost in any part of the world to be educated means to know English. Mydans (2007) argues that as a new millennium begins, scholars say that about one-fourth of the world's population can communicate to some degree in English. Negash (2011) states that as an official language of the African Union and as an international language, English is important for the continent. Spread and emphasised via internet, global political systems, and colonial traditions, English has become the language of globalisation. English manifests itself on the African continent. As more countries in Africa adopt English as an official language, and as more still write English into the public school curriculum, it is worthwhile to examine the economic and political reasons for these important linguistic shifts and the possible ramifications such choices have for the future of language in Africa (Plonski et al., 2013). While researchers like Negash (2011) continue to highlight the increasing role of English in Africa, it is also notable that French is on the decline. While the decline of the French language can be seen throughout the

Francophone world, the most striking examples are found in Africa South of the Sahara, countries which formerly had large French-speaking populations are making the switch to English due to its relevance in Southern Africa, as well as internationally. English can be considered the language of academia, and therefore, English proficiency is a necessity for success at the tertiary level. However, Bogale (2009), using qualitative research results in several regions of Ethiopia, argues that inconsistent language teaching practices and under-resourced teachers make the effectiveness of English language acquisition in the younger grades often inconsistent. These inconsistencies can make success in the higher levels of school more difficult for students, because they do not have the English language skills necessary to succeed. Despite these challenges, Bogale (2009) reports that population surveys reveal that both students and their parents recognise English as “the language of education.” In this sense, there is a strong shared understanding of the importance of English language acquisition (Plonski et al., 2013; Bogale, 2009).

#### 5.7.2.4 Generational age of nursing students “digital natives and digital immigrants”

It emerged from this study that a significant number are above 36 years old, and in this study they are referred to as old generation. It emerged from this study that the older ones (digital immigrants) face more challenges than the younger ones (digital natives), what some participants called new generations. Those challenges are observed in terms of using e-learning in particularly the ability to use computer and internet. Some of the participants in their mid-forties said that they regard computers and WhatsApp to be for the younger generation. Some nurse educators also reported having difficulty facilitating the mature students online, either due to their computer literacy or because of other responsibilities the students may have at home which make them unavailable when needed for online interaction. The native/immigrant analogy can help us understand the differences between those who are comfortable with technology and those who are not. The literature indicates that teachers can learn much from looking at the digital natives and immigrants as diverging cultures (Berman and Hassell, 2014; Ransdell, Kent, Gaillard-Kenney and Long, 2011; Prensky, 2001).

In the context of nursing education in Rwanda, NCNM regulations offer different possible entry points to higher education: direct entries and mature entries. Direct entries are the high school leavers who enter into nursing education, and mature entry are those who have been working and need to upgrade their level. According to the Rwanda Human Resource for Health

Program (2011), the e-learning program is designed to adapt to the learning needs of nurses and midwives who are already working, but who are in need of further training. The curriculum design caters to these stipulations, making the program attractive to those targeted candidates and making it highly likely that they will successfully graduate. The introduction in 2012 of the e-learning platform in Rwandan nursing and midwifery schools has had a positive impact on nursing education (Munyemana, 2012). A significant number of those who enrol in e-learning are above 36 years of age, which put them in the category of digital immigrant according to the definition from Prensky (2001).

#### 5.7.2.5 Lack of policies regarding the e-learning in nursing school

Policies are needed to provide a framework for the development of e-learning, and the absence of such policies is a clear obstacle to the development of e-learning. From data sources in this study, it emerged that there is no specific policy regarding e-learning in nursing schools, no policies on plagiarism and copyright or how e-learning should be managed. Participants interviewed reported that the only policy they know is to teach 40% of module face to face and another 60% in the form of self-directed learning when students are at their workplace. Data from this study demonstrated that there is a need for cross-disciplinary standards for e-learning and belief in the importance of providing faculty who teach online with general guidelines and best practices information.

The literature indicates that before integration of ICT into national education systems can be effective, policy measures need to be established. Policy not only puts ICT in context but also motivates teachers to make adequate use of ICT and more generally to bring about change (Du Toit, 2015). Several countries have embarked on formulating a policy on ICT in education that ideally captures a set of variables including objectives, the availability of ICT equipment, learning materials, and teacher capacities (UNESCO, 2011a). In Africa, InfoDev found that back in 2007 there appeared to be a shift from experimentation pilot projects in ICT towards a more systematic integration of ICTs as per national government policies (Du Toit, 2015; Farrell et al., 2007a). However, eight years later, in most countries in sub-Saharan Africa, most countries remain in the experimental phase, particularly in primary education (UNESCO-UIS, 2015).

It is important for policy to include teacher usage of ICT and plans for its roll-out. The presence of a national and/or education sector-specific policy, plan or regulatory framework for ICT

implementation strategy has a direct influence on teachers' motivation but also on the general environment in which ICTs are rolled-out. The policy can provide for motivation to make use of ICT in the classroom such as pay incentives, additional professional development opportunities and peer recognition. At the moment the UIS survey includes questions related to ICT in education policies, plans and regulatory frameworks, but not specifically in regard to the teacher component. Indicators that better capture the role of teachers and issues affecting them would also be an important consideration for the future (Du Toit, 2015).

Trends and policies guiding the direction of higher education indicate that effectively integrating an e-learning culture within its organisation is indispensable for future educational development (McVeigh, 2009). However, Nyerere et al. (2012) point out that the absence of clearly defined national distance education policies in most African countries poses another challenge. Policies provide standards for the designing of the online program. The absence of such policies is a major hindrance to the online teaching and learning (Nyerere et al., 2012).

Regarding the absence of policies which has been reported by participants in this study, Waterhouse and Rogers (2004) state that it is necessary to have e-learning policies in the course syllabus, and student privacy. The policy goal of the ICT literacy approach is to empower students, people and the organisational staff to use ICT to sustain collective development and improving the economy (UNESCO, 2011a).

#### 5.7.2.6 Resistance to change

In this study, it surfaced that factors such as fear to adopt new technologies, age and poor attitudes towards e-learning as being additional workload, were associated with resistance to change among nurse educators. It emerged from this study that some of the participants preferred teaching students face to face rather than using Moodle. Data further indicated that this resulted in non-facilitation of the students online, and lack of motivation to use Moodle. Some of the reasons given by the participants on why they prefer face-to-face teaching rather than the e-learning platform were as follows: face-to-face teaching allows the teacher to see the reactions of the students, be aware when students don't understand, and explain more; most of the time the Moodle platform is down; teachers try to give to students 80% or even 100% when they are here for two weeks face to face; students complain there is no internet network or electricity in the countryside; teachers don't want to change their mind after Moodle was down for a year and they are used to face to face teaching; e-learning for the students is very

difficult. It is difficult to get the time to collaborate with students when they are in their workplace. Teachers think that the e-learning program level of perception in the course is lower than in the residential course (full-time students); it is difficult to use Moodle, not having been trained, and because teachers are not informed about using Moodle, they don't use Moodle and therefore teach face to face. A lack of motivation has also emerged for teaching in e-learning, because it is considered as an extra task. It emerged from this study that there is an ideological discrepancy between higher education's change in approach and the reality of what students and educators see as a responsibility to prepare them to provide safe patient care, which influenced their decisions over the use of technology. This is particularly because e-learning has been tailored and promoted as a tool to facilitate self-directed and autonomous learning. A number of nurse academics chose to continue teaching in a traditional didactic approach to appease students.

The literature shows that teachers frequently resist ICT-enabled distance education, for several reasons. Where surveys have been carried out on ICT-enabled distance education, evidence exists that teachers frequently view online courses as of poor quality; for example teachers from the United Kingdom in preparation for the 'Vital courses' (Twining and Henry, 2014). Contrasting evidence however also exists that specific service providers such as the Open University are seen as delivering high-quality distance education (Twining and Henry, 2014). In Africa, the number of primary and secondary teachers trained via ICT-enabled distance education programmes other than radio and television seems to be hampered by a lack of ICT infrastructure and affordable connectivity, although several initiatives do exist. For example UNESCO has launched an initiative in Kenya to train teachers on ICT integration in education, but the pilot phase of the project has not yet been evaluated (UNESCO-UIS, 2015; Du Toit, 2015).

In a study conducted in Tanzania by Kisanga and Ireson (2015), it was found that resistance to change was associated with fear of adopting new technologies, negative attitude towards e-learning and a perception that e-learning is an extra load. According to Nursing Times (2013), there is an ideological discrepancy between higher education's change in approach and the reality of what students and educators see as a responsibility to prepare them to provide safe patient care which influenced their decisions over the use of technology. This is particularly because e-learning has been tailored and promoted as a tool to facilitate self-directed and autonomous learning. A number of nurse academics chose to continue teaching in a traditional

didactic approach to appease students (Nursing Times, 2013). Studies are constantly reporting that e-learning projects are failing because teachers and students are used to traditional teaching and to the resistance to change according to the new era of technological advancement (Parlakkılıç, 2014a).

#### 5.7.2.7 Issues of interface design with the Learning Management System

An interface is a boundary across which two systems communicate. There are many software interfaces within Moodle, such as the interface a module uses to communicate with the core product, or the interface used to send mail. In this study, it emerged from the data collected on Moodle from three campuses where this study was conducted that there is a lack of proper organisation of Modules on Moodle. It is quite difficult to know which level a given module is taught, the semester and even the weeks in which various units were covered. From Moodle analysis from the three campuses, the findings indicated that there are no ethical guidelines on how Moodle should be used for academic purposes, and there is no Moodle user guide document. From further analysis, it was found that the quality of forum discussion and chat was low. Log reports indicate overall a poor participation of students and teachers; some students have never logged in, and some teachers, co-teachers, and campuses managers don't follow what teachers and students are posting online.

The growing popularity of the internet and the rapid advances in web-based technologies has extended the boundaries and pedagogies of teaching and learning. A prominent example is the use of LMSs to complement face-to-face instruction in various educational settings, particularly in higher education (Cheng and Chau, 2016). However, the implementation of LMSs in education, however, faces two major challenges. The first relates to different learning styles (Cheng and Chau, 2016). Another challenge is teachers' scepticism about the effectiveness of online activities in improving learning (Cheng and Chau, 2016). In a study by Nyandara (2012), it was found that until March 2011 most of the courses at the Open University of Tanzania were not uploaded in the Moodle, implying that there was minimal use of Moodle at the Open University of Tanzania for teaching and learning.

In this study, from Moodle analysis from the three campuses, the findings indicated that Turnitin is not included in Moodle, so that it is not possible to check for plagiarism. According to Snowball, Silvey and Do (2015), teaching transitioning students about academic integrity and enabling them to find their authorial voice is a prime concern to educators in the higher

education sector. Increasingly the text matching software Turnitin has become the platform of choice to detect plagiarism and assist universities in upholding their academic honesty policies. Learning writing skills and understanding academic integrity is a challenge for many transitioning students, particularly second language and alternate pathway students (Snowball et al., 2015).

## **5.8 CONSEQUENCES**

According to Strauss and Corbin (1990), consequences represent the expected and unintended outcomes resulting from actions and interaction.

### **5.8.1 Intended outcomes**

In this study intended outcomes were put into the following sub-categories: (a) Nursing and midwifery education, (b) Health system, (c) Nursing practice.

#### **5.8.1.1 Nursing and midwifery education**

In this subcategory, it is expected that effective e-learning in nursing and midwifery education would result in producing competent nurses and midwives who are able to respond to health-related issues of the society. The use of e-learning is expected to bring about the following improvements:

(i) Increased quality of education: By using effectively e-learning platform, it is expected that the quality of education will increase. This is based on the fact that e-learning promotes student-centred approaches where students are self-directed, learn collaboratively and do research, and which in return promotes inquiry-based learning. This will allow students and nurse educators to be quite familiar with the technology, such as computers, internet, learning management system and ICT in general, to access updated information anytime and anywhere, which will help them to provide evidence-based practice when they graduate.

(ii) It expected that students and teachers will acquire professional and personal development and growth in terms of using student-centred approaches such as adult learning, self-directed learning, active learning, critical thinking, and collaboration.

(iii) Integration of theory and practice in order to promote evidence-based practice.

(iv) Responsiveness to national policies and laws: It emerged from the document analysis and the interviews that the use of e-learning in nursing and midwifery education was a response to Rwanda's Vision 2020 and to a number of laws such as the law establishing the nursing council, the law establishing the scope of practice for nurses and midwives, the law establishing higher education, and the law establishing University of Rwanda; all these laws called for a change in preparation of health professionals to enable them to meet the needs of the society.

In nursing education, e-learning is helping nursing students to become competent and qualified professionals (McKenzie and Murray, 2010). The use of ICT, and in particular e-learning has allowed the working nurses to upgrade their levels, as it combines both site teaching and online learning. When students have full access to information irrespective of the time and the location, they take more control of learning, collaborate and engage more actively in their learning (McKenzie and Murray, 2010).

It is expected that students and teachers will acquire professional and personal development and growth in terms of using student-centred approaches such as adult learning, self-directed learning, active learning, critical thinking, and collaboration. In a self-directed learning experience, students become part of their learning, and based on their previous knowledge and experiences, they construct their own understanding. This allows them to integrate the acquired knowledge and skills into their practices (Cornelius, Gordon and Ackland, 2011). Collaboration enables the students to be part of the wider learning community, thus allowing them to be part of the dynamic world. The low-cost of e-learning is considered to facilitate students to further studies. The success of e-learning helps the students to become more confident, proactive and to gain more knowledge to use of technology (Bohonos, 2014).

#### 5.8.1.2 Health Systems

Using e-learning as a medium of instruction is expected to increase the nursing and midwifery workforce in short time and in a resource constraints context. This will bridge the gap of qualified nursing and midwifery workforce in various clinical settings. By looking at the big number of graduates expected to graduate each year, who are competent, it is expected that there will be an improved quality of healthcare services at all levels. The health system is becoming more and more digitalised and new graduates are expected to be skilful enough to use the technologies used in the Rwandan health system and beyond.

The WHO (2015) states that the quality of nursing education has a great impact on solving health related problems. Nursing education should have the capacity to produce competent nurses a large scale, who are capable of responding to the need of the communities where they are posted. In order to achieve this, it is necessary to use innovative approaches including integration of technology into nursing education (WHO, 2015). ICT assists to respond to the need of the population, through adequately trained healthcare personnel (WHO, 2015).

### **5.8.1.3 Nursing Practice**

The use of ICT is progressively being used healthcare professionals as means of communication and on-job learning. Although working and studying in a clinical environment is challenging, in the context of Rwanda healthcare workers are increasingly using technology in the clinical setting in relation to record keeping and communication. It is expected that e-learning will help to correct bad nursing practice routines by integrating newly acquired knowledge into nursing practice, thus improving the services provided to the clients in various clinical settings. It is expected that students and teachers during their clinical placement will make a huge impact on the quality of nursing care and services are provided to the patients guided by E-Health in Rwanda.

The WHO (2015) reports that the shortage of health-care workers at the global level has required universities and colleges to use innovative teaching and learning approaches, and ICT is promising, as it offers new modes of delivery of education through e-learning. According to Williams (2010), on-job training is very important to educate nurses where classroom learning is not possible. For the working professionals, learning focuses on practices, empowering the students to use their experiences as the foundation of their learning. When it is done continuously, it creates a culture of a learning organisation. For this to be possible, institutions should provide resources and effective facilitation (Williams, 2010).

### **5.8.2 Unintended Outcomes**

The sub-categories that emerged from this study were collaboration and partnership, and transferable learning experiences.

### 5.8.2.1 Collaboration and partnership development

Collaboration emerged as an important outcome in the process of analysing the utilisation of e-learning platform and the development of a middle-range theory to guide its facilitation. In this collaborative partnership with various stakeholders during the data collection and data analysis, and in the development of a middle-range theory, the partners provided necessary information that was required for the study, and they facilitated those who were trained in the use of Moodle for future sustainability. It emerged from the findings that the partnership between the selected nursing and midwifery school and other higher teaching and learning institutions, the Ministry of Health, Rwanda HRH, the Ministry of Education and the National Council for Nurses and Midwives was vital in the implementation of e-learning, in terms of providing all necessary requirements for success of e-learning in nursing and midwifery education.

Document analysis indicated that through the Rwanda HRH program, faculty from the United States teaching institutions (USF) "twin" with Rwandan faculty to transfer skills. This type of collaboration and partnership is vital to the future sustainability of e-learning (Mukamana et al., 2015; Binagwaho et al., 2013). Collaboration brings all stakeholders into a new relationship with a joint commitment to a shared vision. Such a relationship requires comprehensive preparation, implementation, and well-defined terms and conditions (Ficapal-Cusí and Boada-Grau, 2015; Jordan et al., 2000). Similarly, Kakuchi (2014) reports that collaboration between higher education institutions is pivotal for the success and sustainability of educational development.

### 5.8.2.2 Transferable learning experiences

It surfaced from current study that transferable skills go beyond what is learnt in a formal context. Everything one does has the potential to help him or her gain and develop transferable skill. It is expected that students and teachers acquire transferable skills in terms of using science and technology, and in particular the e-learning platform, and critically showing responsibility towards nursing and midwifery education and health environment. It is expected that all stakeholders will collaboratively work in a team and will strive to achieve skills in computers, social networking, communication, information gathering, research, and customer care. It is expected that nurse educators and nursing students will gain transferable learning

experience from the training and sharing experiences through the twin model of the selected school with US faculty through Rwanda HRH.

According to UNESCO (2015), regarding transferable skills, core elements of an education to develop global citizenship such as creative and innovative thinking, problem-solving and decision-making; behavioural capacity to launch and engage in proactive actions. Aksal, Gazi and Isman (2008) state that transferable skills are core skills that learners need to develop within their academic life. These skills will be essential in their future careers. Both collaborative and experiential learning environments help to provide concrete learning and develop transferable abilities in communication, openness to learning new skills, working in a team, solving problems, adapting knowledge to new situation with minimum supervision, understanding ethical implications of decisions, questioning, thinking logically, creatively and critically, making analysis taking responsibility (Ficapal-Cusí and Boada-Grau, 2015; Ali, Joyes and Ellison, 2014; Aksal et al., 2008).

## **5.9 RECOMMENDATIONS**

### **5.9.1 Education**

The findings indicated that a significant number of nurse educators did not have qualifications in nursing education, and that there was a lack of capacity-building initiatives for facilitators in e-learning, in particular for new staff members, which are pivotal to the success of e-learning. Therefore, we recommend that new academic staff members need to be orientated and inducted into the facilitation approaches used in e-learning system, and particularly on how to facilitate nursing students via LMS. It was found that some participants, both nursing students and nurse educators, received insufficient training in ICT; thus continuous support and capacity building for nurse educators and nursing students needs to be planned by the school and should extend across sufficient time until new members of academia are sufficiently confident to adopt ICT in their teaching and learning strategies. This is very important, as e-learning in the selected school is still new, and due to challenges encountered some become resistant to using e-learning as it was initially planned and prefer to go back to the traditional teaching methods, as has been reported in this study. ICT is dynamic, and further technological innovations in education continue to emerge. Thus newly recruited nursing staff and nursing students,

irrespective of their experience in teaching or year of study for nursing students, should continue to be updated through invoice training.

Data from this study indicated a number of constraints such as staff shortage, lack of motivation due to work overload, poor access to LMS, poor computer literacy, language barriers among the students, and inadequate infrastructure to accommodate larger numbers of students, such as classrooms, computer laboratory and practical skills laboratory. For the success of e-learning we recommend recruitment of more qualified teachers, provision of incentives to nurses educators and ICT managers, increasing the internet speed, training both nursing students and nurse educators in the academic use of computers and internet, and planning a refresher course in English to assist the nursing students who have difficulties with the language on a continuous basis. This is because the majority have previously been trained at A2 (diploma level) in French, and English becomes a challenge as a medium of communication in teaching and learning. Furthermore, we recommend expansion of the infrastructure, as the data from this study indicated that regular students and e-learners both have to use the same facilities. According to various data that emerged from this study, using teleconferencing would be one of the solutions, where lecturers can give lessons to a wider number of students while they are in their respective workplaces, as initially planned. It also emerged that there is an absence of policies regarding e-learning, and we recommend that these policies be developed to serve as guidelines or boundaries in using e-learning education in nursing, which would include the interface design of Moodle, as some issues have been reported related to its use which may limit the users' active participation synchronously or asynchronously.

### **5.9.2 Practice**

As the majority of the nursing workforce across the country, (around 90%) are A2 diploma holders, we therefore recommend putting an emphasis on capacity-building in specialised skills in healthcare technology before nurses enrol in the e-learning system for in-service training or for continuous upgrading of the level of nursing and midwifery in various fields using technology-based education. We also recommend provision of technical guidance to strengthen legislation and policy for promotion of e-learning among healthcare professionals, and to instil a culture of inquiry-based learning based on the existing technologies at all levels of the health sector.

This study demonstrated that the e-learning system in Rwanda started under the initiative of the Ministry of Health with other stakeholders. Therefore, we recommend that this middle-range theory of e-learning in nursing education be tested in order to facilitate the expected outcomes of web-based learning for health professionals, in particular in nursing and midwifery.

This study has highlighted a number of challenges related to the implementation of e-learning in the selected school; therefore we recommend provision of technical support to plan and implement strategies that are in line with the global strategy on HRH and the global code of practice for the nursing and midwifery workforce.

We recommend the accreditation of nursing and midwifery training programmes and institutions according to international standards on using e-learning systems.

### **5.9.3 Research**

This theory which has been developed has not been tested yet; hence a study to test this theory is highly recommended so that it can possibly be adopted for the improvement of nursing education in Rwanda. Testing this theory can validate its effectiveness and possible use in nursing education. Further studies are recommended to evaluate e-readiness of e-learning users in nursing education using the concepts from this middle-range theory will be of a high importance to provide a wide-range product to reframe and guide e-learning in nursing education in order to achieve its intended outcome for education and health sector.

Data from this study indicated that nursing students are enrolled in e-learning program at an advanced age, and a significant number reported to have used technology when they started e-learning program, and using English as a language of instruction was a challenge, therefore an exploratory study to analyse factors that influence students' to join nursing and their intentions to stay in the profession upon graduation is recommended. This inquiry can assist in devising strategies or recommendation on the selection process, and guidance of nursing schools to guide mature entry in e-learning.

The findings indicated that nurse educators and nursing students have an excessive workload due to this blended mode of e-learning system; hence we recommend that an inquiry be conducted on the lived experience of this work overload, on how it affects the quality of education, on how it affects the quality of care that nursing students provide once they return

to their workplace, and on how they put into practice what they have learned in this blended mode of learning.

Data on the learning management system showed that MOODLE in the selected school was underutilised by nursing students and nurse educators, and that there was a lack of follow-up of activities done on the platform; thus we recommend an exploratory study that would highlight the factors of this underutilization, in order to enhance its utilisation.

## **5.10 LIMITATIONS**

This study was conducted at three of the six campuses of the selected public nursing and midwifery school. However, although the three campuses were purposively selected according to the geographical location by provinces in Rwanda, no private institutions were included in the study and this limits transfer claims. Nevertheless, the contextual conditions closely resemble those of other resource-constrained settings, which increases the chance of transferability.

The number of the nurse educators at one of the three campuses was inadequate, and at one campus it was not possible to include the ICT manager and the campus manager. At the latter campus the ICT library was closed for most of the period of data collection at that particular campus, due to the fact that with the recent transformation in higher education the designated ICT manager was engaged in other duties at the central level.

During the implementation phase of the plan, when an urgent emerging concept was to train nurse educators on the use of MOODLE, some participants left earlier than expected which changed their degree of involvement. As a researcher, and having previously studied in the same institution, coming back to my former teachers as their trainer was a key challenge.

There was a methodological limitation in regard to the reflective sessions that we as a team had planned on the emerging concepts and the way forward; to accommodate geographical location we had agreed to use Moodle and a forum discussion was chosen, but because co-researchers were occupied with other duties, the frequency of reflections was limited, and many chose to share their reflections via e-mails and chats rather than forum discussion. The emerging data from different stages were not consistently reflected on, although these reflections were important for insights and ideas concerning the study. Nevertheless, the team remained instrumental in reviewing the principal researcher's journal entries and were able to comment

and give constructive help in identifying biases. The technological and pedagogical expert was instrumental in developing this middle-range theory.

Accessibility of the participants was another limitation in this study, in particular during in-depth interviews; some told the researcher that he had to be quick in his interview, which limited the probing questions to expand further on issues. In the quantitative study, some couldn't complete the questionnaires, reporting that they had other duties, or lost the questionnaires. In some cases, the research team had to reprint, or as a principal researcher, I had to send an online question for completion. The length of the questionnaires was also reported as an issue, which might have affected the way respondents answered the questions.

## **5.11 CONCLUSION**

The findings in both qualitative and quantitative data sets corroborated one another, and showed that e-learning in nursing education in Rwanda can be described as a student-centred approach in which blended learning enables fast-track production of the nursing workforce, taking into consideration the history of Rwanda. In this regard, participants reported that e-learning in nursing education is seen as self-directed, collaborative, interactive, inquiry-based learning, which integrates theory and practice.

In regard to e-learning as blended learning, study participants reported that they attended both face-to-face learning sessions (constituting 40% of the teaching period) and online self-directed learning sessions via the Moodle online platform (constituting 60% of the teaching period). Participants reported that this form of blended learning was flexible because it enabled students to search for information, and when they come back to school they could engage further with the teachers on particular points which they had not understood. It was also noted that teachers use interactive and innovating teaching methods in particular during classroom sessions, such as the use of videos, participatory teaching, and small-group discussions. For the part that was done online, a number of resources were made available to students, with encouragement to be proactive in their learning through forum discussion, chatting, doing quizzes and assignments. It was also noted that blended learning, whether synchronous or asynchronous, gives participants the chance to become more familiar with the technology. Participants regarded this form of learning as time-saving and cost-effective, creating accessibility of resources anytime and anywhere, and providing a tool for widening access to nursing in a resource-constrained environment. It emerged that different teaching methodologies were used: teachers facilitate

students face to face sessions and the final exam was done during face-to-face sessions. Various methods were reported such as brainstorming, group work, group assignments, student presentations, use of videos and demonstrations, lecturing, and giving tests and exams while the students are at the school. Participants reported that various factors influence them to use a given technique when facilitating students, such as the course subject, availability of resources, and level of engagement of the students.

In regard to e-learning for fast-track production of the nursing workforce in the context of Rwanda, a point that emerged in the study was that the health sector was seriously affected by the loss of health professionals who were killed during the genocide against the Tutsi or who went into exile. Document analysis showed a predominance in the health sector of nurses with A2 (Diploma level) qualification, which had to change in order to meet regional and international standards. Following the closure of the A2 schools, the five remaining schools were left to make up the shortage in the supply of qualified nurses. There was thus a need for training on a large scale to enable A2 level nurses to upgrade their qualifications to A1 (Advanced diploma) level without leaving their jobs, and for this purpose (as confirmed by document analysis and participant responses) the e-learning platform was perceived as a flexible tool for widening access to nursing and midwifery education irrespective of the student's age.

Although e-learning was perceived positively by the participants, they also reported a number of challenges and resource constraints such shortage of staff, insufficient infrastructure, internet problems; insufficient training of nurse educators and nursing students, lack of policies regarding e-learning, resistance to change on the part of nurse educators, and issues of Moodle interface design. Recommendations were made in relation to education, practice and research to address this issue for the future sustainability of e-learning.

# **CHAPTER 6**

## **A MIDDLE-RANGE THEORY OF E-LEARNING UTILISATION IN NURSING EDUCATION**

### **6.1 INTRODUCTION**

The current study established that there were gaps on the way e-learning in nursing education was used in selected schools. Using participatory action research, participants were involved in designing a middle-range theory to promote ownership and guide adoption of e-learning in Rwandan nursing schools. Grounded theory methods served as a frame for the generation of a theory through open, axial and selective coding, as recommended by Strauss and Corbin (1990).

According to Strauss and Corbin (1990), grounded theory enables the generation of grand theory or substantive theory. The difference between these two is the level of abstraction of concepts and their applicability to situations. Grand theories focus on very broad abstract concepts and are applicable to wide range of situations, whereas substantive theories focus on situational context, and are referred to as middle range theories as in this study (Chinn and Kramer, 2008; Chinn and Kramer, 1999). The foundations of this middle-range theory of e-learning in nursing education is paradigmatic in nature, with the purpose of communicating what emerged as the participants' conceptualisation and practice in this study (e-learning), and taking into consideration the particular context of Rwanda, as recommended by Fawcett (2005). According to Butts (2011), the function of the theory is closely linked to how good the theory is, and a good theory is one that helps us to understand the world.

The core phenomenon in this study was e-learning in nursing education and the research was conducted in Rwanda, at three campuses of the selected nursing school. Underpinning this study is pragmatist or experimentalist educational philosophy which holds that the purpose of education is to guide students to be able to connect their everyday experiences and their education, to become responsible and critical citizens in a democratic society (Dewey, 1934). Thus, the generated theory is action-oriented and change-focused as noted in the action phase of the study which involved the facilitation of nurse educators (at one of the selected campuses) in use of the Moodle learning management system as part of e-learning. During and after

training of the nurse educators, changes were noted, as mentioned in Chapter 4, relating to their views on perceived benefits of using e-learning and challenges which they encountered as e-learning users. The middle-range theory generated is presented diagrammatically as a conceptual model. The model developed is described in further detail with the aid of graphical presentations of each concept and subconcept.

This model is presented in line with the six elements proposed by Chinn and Kramer (2008) as essential in describing a theory: (i) the purpose of the theory, (ii) the concepts (iii) concept definitions, (iv) conceptual relationships, (v) structure of the theory, (vi) theory assumptions. These six elements are used to explain or describe the model and to demarcate the boundaries of e-learning in nursing education in the context of Rwanda.

## **6.2 PURPOSE OF THE THEORY OF E-LEARNING UTILISATION IN NURSING EDUCATION**

According to Chinn and Kramer (2008), purpose is concerned with why the theory was formulated and specifies the contexts and situations of application. The e-learning in nursing middle-range theory was developed in Rwanda as an explanatory theory using grounded action research for the purpose of generating new knowledge about e-learning in nursing education in Rwanda. It is explanatory because the model has been developed collectively, and consists of an explanation of what all stakeholders in e-learning in nursing education believe about the nature and the facilitative and inhibiting conditions of e-learning, and how e-learning can be used effectively in nursing education. The main purposes of this middle-range theory are:

- (i) To provide a framework that can be used to promote professional development and to guide practitioners in using technology in education.
- (ii) To provide guidelines that can be used in the establishment of a supported network learning space by using technology in teaching and learning, and to support nursing education challenges in a fluid and dynamically changing practice context.
- (iii) To provide an instrument that can be used to widen access to nursing and midwifery education by developing their specific e-learning related teaching and learning activities.

(iv) To provide a tool that can be useful in assisting nurse educators, nursing students and other stakeholders to generate context-driven knowledge and practice, by using the technology in education, particularly in nursing education.

### **6.3 CONCEPTS AND DEFINITIONS OF THE MODEL**

According to Chinn and Kramer (2008), a definition is an explicit meaning that is conveyed by a 'concept'. Definitions exist to clarify the nature of abstraction that the theorist constructs in a way that others can comprehend. Definitions suggest how verbal representations of an idea (concepts) are expressed in experience. The same authors state that concepts may be defined in a list of definitions, or they may be defined in a narrative form in the text but not labelled as definitions. However, it is not always easy to recognise narrative as definitions because they are not labelled and may contain information that is pertinent to the definition of the concepts (Chinn and Kramer, 2008).

Chinn and Kramer (2008) explain that identifying and defining theoretically relevant concepts of the theory form the basic fabric and structure of a theory and that identifying the relevant concepts provides dimension and structure to the theory. These authors note that the words or concepts in a theory can be utilised in a relatively associative definition or in a relatively specific definition. A relatively associative way of defining terms was adopted in this study as it allows for the abstract meaning of the concept to be used, and, as explained by Chinn and Kramer (2008), is a most useful way of defining concepts for a middle-range theory. Figure 6-1 gives a diagrammatic representation of the middle-range theory of e-learning in nursing education.

E-learning is presented as the central phenomenon in this study, and in this model, around which other concepts evolve. E-learning involves experiences and actions that occur in the context of nursing education, and technology. The core concept in this model is **e-learning in nursing education**, and there are four main concepts in the model: (i) E-learning in nursing education context; (ii) catalyst agents; (iii) hybrid teaching and learning; (iv) outcomes. Each of the concepts is formed by a number of sub-concepts, and each concept is defined within its sub-concepts and is presented visually to show the relationship among subconcepts.

MIDDLE RANGE THEORY OF E-LEARNING IN NURSING EDUCATION

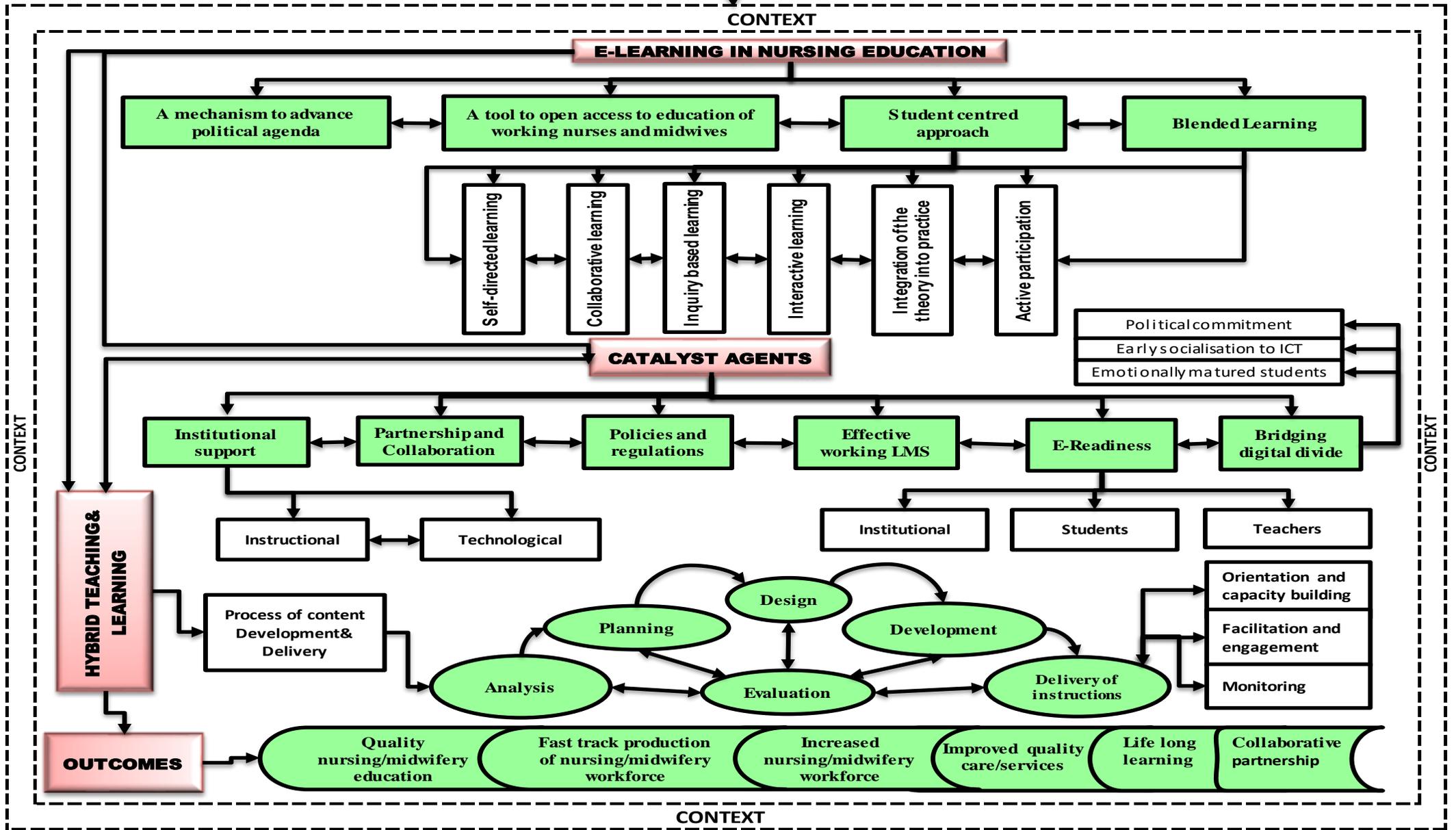


Figure 6-1: Middle-range theory of E-learning in Nursing Education

In this model, E-learning nursing education is presented as a core phenomenon and is conceptualised as (i) a mechanism to advance a political agenda, (ii) a tool to open access to education for working nurses and midwives, (iii) a student-centred approach, (iv) blended learning.

### **6.3.1 E-learning as a mechanism to advance a political agenda**

E-learning in this middle-range theory emerged as a mechanism to advance a political agenda, as e-learning is part of Rwanda Vision 2020. Rwanda is in the process of transforming education to meet the needs of the country and be credible and comparable internationally. According to this model, government has a pivotal role in establishing and sustaining e-learning in the country. Because e-learning is seen as a driving political agenda in Rwanda, government established a fibre optic cable network, sourced expertise outside the country to develop the online learning platform, built capacity within the country for its sustainability, and is responsible for maintaining the platform and the human resources to manage the platform. More importantly, government provided a policy framework which serves as the basis for establishing and utilising e-learning across the higher education sector. This framework was adopted by higher education.

### **6.3.2 E-learning as a student-centred approach**

E-learning embraces a student-centred approach. In this subcategory are a number of domains: student-directed learning, collaborative learning, inquiry-based learning, interactive learning, active engagement, and integration of theory and practice.

The **self-directed learning** domain, as evidenced in the findings, accounts for 60% of the whole curriculum. Self-directed learning in this model aims to promote and foster the skills associated with becoming autonomous, self-directed students.

The **collaboration** domain is a key point between and among the teachers and students. Students learn in teams as they engage with learning activities and materials. Through collaboration, students learn to work in teams. Cooperation among students allows them to contribute and encourage each other. To achieve collaboration, students need to have shared responsibilities and vision in solving problems, as they give and accept feedback from their peers and teachers.

The **inquiry-based learning** domain is based on learning by doing, developing reflective practice, and is problem-based or project-based. It is also interpreted as a form of discovery, allowing the students to reflect, observe and explore, plan and predict, and thereafter experiment and reflect. In inquiry-based learning, students collect information from various sources, critically analyse it, and later take decisions. Through e-learning, students access more up-to-date information than in the old books which can be found in the library. The inquiry-based learning in this model is facilitated through questions asked in the forum discussion or online discussions, or through assignments (individual and group assignment) where students have to find information from a number of sources in order to respond to the task given.

The **interactive learning** domain is a way of engaging the students and keeping them motivated for a better understanding of the lesson. Interactive learning promotes purposeful exchange and confrontation of ideas through the involvement of peers and/or teachers, and all students have an equal right to contribution. Interactive learning is achieved by making lessons more interactive through the use of videos, pictures, PowerPoint animations, forum discussion, and chatting, including web links which may attract the attention of the students. Interactive learning is also achieved through participative group discussion, brainstorming, small-group discussion and case scenarios.

The **integration of theory and practice** domain leads students to become agents of change by using evidence-based practices. In putting theory into practice, linking what they have studied in theory with clinical practice, students provide care that is patient-centred, and become creative and critical thinkers. It is expected that nursing students will bring to the classroom their clinical work experience that they have accumulated over the years, which makes the course more interesting, and that they would also apply the knowledge acquired from the school to change malpractices in their respective work settings.

The **active participation** domain refers to the active involvement of adult students in their own learning, which assists them in their own knowledge construction. Through e-learning, students actively participate in the learning process in partnership with teachers and other students. Students' contributions will be accepted with respect by other students and the teacher, and the challenges and debates will be part of the agenda. The active involvement is achieved through face-to-face and online interactions. In online participation, the students interact with teachers and peers either synchronously or asynchronously. In synchronous participation, students

engage in real time through instant messaging or live chat and forum discussions which allow students and teachers to collaborate and learn in real time. In asynchronous participation, the information is shared among students and teachers outside of real time and place, through email, electronic mailing lists, online discussion forums and chatting; Moodle as the learning management system facilitates discussions, posting and replying to messages, and uploading and accessing online courses and multimedia.

### **6.3.3 E-learning as blended learning**

The blended learning subcategory refers to the way that e-learning functions in nursing education. E-learning is conceptualised as blended learning that uses both online and face-to-face teaching and learning.

**Online teaching and learning** refer to teaching and learning using the internet and other ICT tools, including learning management systems such as Moodle. In blended learning, students interact with faculty and with other students, which is an essential characteristic of e-learning. In this model, online teaching and learning account for 60% of the whole curriculum, and it is facilitated through a variety of ways, including video conferences, forum discussion, electronic communication via e-mails and chat groups, and with constructive and timely feedback on student assignments and questions. Students are instructed to use proper methods of searching for information, and how to assess the validity of resources. For online teaching and learning to be effective, course development benchmarks should be considered, which include guidelines on minimum standards for course development, design and delivery, and determining the technology being used to deliver course content. It is essential to review continuously teaching resources to guarantee that they are in line with educational requirements.

In **face-to-face instruction**, there is the physical engagement of the students and the teachers. E-learning in its blended mode includes face-to-face teaching and learning sessions because this allows nursing students to be connected to the teaching institution and their classmates, and facilitate effective students–teachers interactions. Due to the nature of the nursing profession, 40% of the curriculum time consists of face-to-face interaction. In the face-to-face part of e-learning, nursing students and teachers establish a collaborative learning environment that facilitates successful learning and promotes verbal and nonverbal communication.

### **6.3.4 E-learning as a tool to open up access to education for working nurses and midwives**

In this model, **opening up access to education** is a subconcept of e-learning in nursing education. The access is to high-quality educational experiences and resources through the elimination of barriers to this goal. Opening up access to education is for **students currently working** in various health settings as nurses and midwives, **students from rural or remote areas**, **students with family responsibilities**, and **students with financial challenges**. E-learning is viewed as **a tool to open up access to education** by creating a conducive environment for teaching and learning where rich content can be deployed easily, quickly and cheaply. Instead of school-based learning sessions, e-learning allows virtual communication among teachers and students through e-mail, discussion forums, chats, audio/videoconference and instant messaging, while making almost infinite worldwide resources available to students. In this model, e-learning in nursing education is viewed as a flexible tool for widening access to nursing and midwifery education irrespective of the age and location, and in a resource-constrained environment.

## **6.4 E-LEARNING IN THE NURSING EDUCATION CONTEXT**

In this model, the concept of e-learning in nursing education is shaped by its nature and context. The context is the platform within which the teaching and learning environment is situated, and is comprised of the structures, processes and procedures that serve to guide, regulate and determine e-learning in nursing education in Rwanda for the production of competent graduates who are ready for practice on registration. These are organisational, regulatory and interactional domains within the e-learning environment that influence processes and practices for nursing education. The organisational domain is comprised of the gatekeepers of health, nursing and education, the Ministries of Health and Education, the nursing schools and the regulatory bodies (the National Council for Nurses and Midwives, and the Higher Education Council). This requires collaborative and collegial development strategies for establishing, implementing and monitoring e-learning in nursing education. The regulatory domain involves the processes, procedures and protocols that provide a legal framework for nursing education activities. The Rwandan Nursing Council and the Higher Education Council are the custodians of the latter.

The interactional domain is the set of actual instructional processes in e-learning. In this model, the interactional element reflects the ability for the teacher to facilitate or mentor the students through either face-to-face or online interactions. It is essential that the academics have dedicated and uninterrupted time to devote to student learning. In face-to-face interaction, quality time for students should be in the form of class presentations, group work, workshop facilitations and one-to-one consultations. In online interaction, collaboration is done through Moodle, forum discussion, email, chatting, videoconferences or video calls. This can be done in real time, also known as synchronous communication, or offline, also known as asynchronous communication. The interactive nature of this property reflects the human capital from which the physical, cognitive, and socio-emotional and spiritual components derive. The physical element involves the health educational actors, students and facilitators (academics and ICT experts) who need to be physically able to teach and learn in nursing schools through e-learning. The cognitive element involves the actors' ability to identify, manage or solve teaching- and learning-related issues in e-learning. This involves critical-thinking and decision-making skills that are learned by students as they are continuously subjected to the hybrid e-learning environment. The socio-emotional element involves the interactions and relationships formed within the school's teaching and learning atmosphere, and the emotional responses that accompany the interaction during student learning. The socio-emotional component is also critical in the e-learning environment because it determines the atmosphere in the nursing schools – whether it is positive and supportive of learning. The spiritual component includes the sensitivity of actors to the moral, cultural and religious beliefs and values of self and of others, and this is important for the success of e-learning.

The context of e-learning in nursing education is subdivided into instructional context and technological context, represented by two broken lines that indicate influencing factors from within the actual context and outside of the context. Factors within the context of e-learning in nursing education are the teaching and learning environment, the actual facilitation of teaching and learning, and other factors such as sociodemographic characteristics of the nursing students and nurse educators, constraints encountered while using e-learning, pedagogical and ICT literacy and language literacy. All of these are factors that prompted the development of this conceptual model for e-learning in nursing education. E-learning in nursing education is also influenced by factors outside the context, such as Rwanda Vision 2020, the changing nature of national health and educational policies and national health imperatives, and sub-regional and

global trends in health and education – external factors that also pointed to the conceptual model. The broken lines representing the context signify too that the e-learning model for nursing education is organic and evolves and responds to changes in its context.

## 6.5 MODEL PROCESSES

The e-learning model in this study is presented as a process outcome involving two major concepts: facilitating catalysts, and hybrid teaching and learning.

### 6.5.1 Catalyst agents in e-learning

In this model, the concept of catalyst is used to refer to the prime agents of any change in e-learning. Successful e-learning and future sustainability of the programme require a number of conditions to be in place. These catalysts include the following subconcepts: institutional support, partnership and collaboration, effective working LMS, policies and regulations of e-learning, e-readiness, and bridging the digital divide (Figure 6-2).

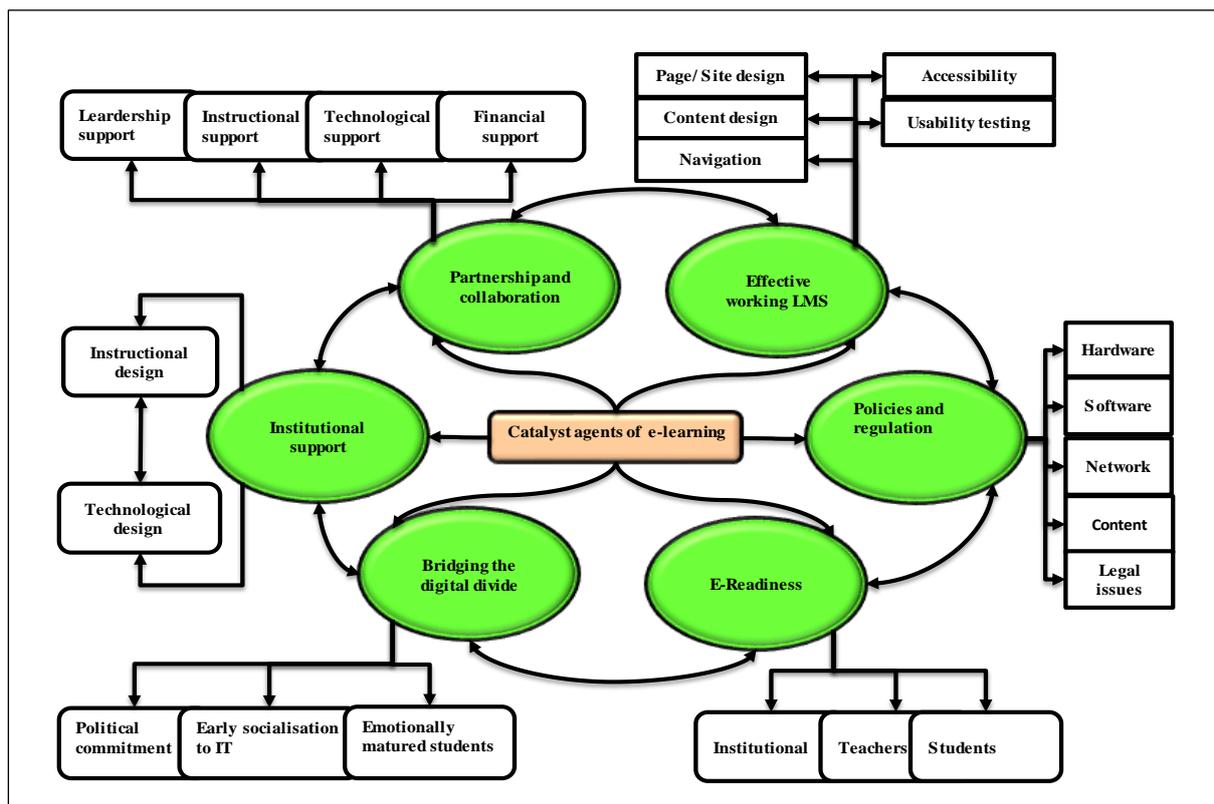


Figure 6-2: Catalyst agents of e-learning

**Institutional support:** The subconcept of institutional support relates to the domains of instructional design and technological design. The **instructional design domain** is putting in

place an environment that foster learning by providing instructional contents and tasks that involve students and enable meaningful learning. This is also concerned with developing programs for teaching and training in a reliable manner. In this model, the instructional design domain is viewed as a framework for producing modules and courses that will facilitate learning through active participation and involvement of the students.

The domain of **technological design** denotes a framework for facilitating the use of technology in education. The school needs to have several computer labs that are accessible by students. Each lab should have a sufficient number of computers with internet access and a wide range of software (Microsoft Office, Open Office, Endnote, SPSS, NVIVO, etc.); each lab should also have an ICT officer/manager and a projector. The model also calls for a separate computer lab (the technology teaching lab) which must be open daily with support staff, and is designated for helping education majors with technology. The resources and support available add significantly to the broader context and potential for various teaching methods.

**Partnership and collaboration:** In the context of e-learning in nursing education, the subconcept of **partnership and collaboration** is very important. In the partnership, stakeholders benefit in one way or another. Benefits to partner organisations include: access to staff for leadership, teaching (theoretical and clinical teaching), research, and experts in ICT (e-learning in particular). The partnership and collaboration also facilitate the establishment of common ground for innovative programs, accessibility to resources, shared expertise and career development.

**Policy and guidelines:** The subconcept of policy and guidelines is an important catalyst for e-learning in nursing education. In this model, the availability of national or educational sector-specific policy or **frameworks** for ICT implementation has a direct influence both on teachers' motivation and on the general environment in which ICT is rolled-out. The policy provides for motivation to use ICT in the classroom in relation to **hardware, software, network or internet, legal issues** (e.g. plagiarism, copyright), payment **of incentives**, additional professional development opportunities and peer recognition.

**Effective learning management system:** In the context of e-learning, the subcategory of effective working learning management system (LMS) is a cornerstone to the success of e-learning. The LMS serves as a learning platform, which is a set of interactive online services that offer students with accessibility to academic resources through internet. This allows the

students to access learning resources irrespective of the time and the location. In this model, a good LMS is concerned **with page/site design, content design, navigation, accessibility and usability** (of Moodle in this case).

**Bridging the digital divide:** The subcategory of **bridging the gap in ICT** is vital for the success of e-learning. The domain of **political commitment** emerged as a way to bridge the digital divide by setting policies and frameworks for using ICT in education, putting in place infrastructure such as suitably equipped computer laboratories, hardware and software, internet, electrification of the country, staff training in instructional and technological approaches to e-learning, funding the expansion of infrastructure, capacity building of the existing academic staff, and recruiting new academic staff. The domain of **early socialisation to ICT** emerged as part of bridging the gap in ICT. This is done by introducing computers in primary schools (the “one laptop per child” program), and provision of one computer per student in higher education. The domain of **emotionally mature students** emerged as an important aspect to consider in bridging the digital divide. This is because e-learning in nursing education is concerned with upgrading the level of working nurses and midwives. Nursing students enrolled in e-learning can set their learning goals and are committed to learn new competencies, particularly in the field of ICT.

**E-readiness:** The subconcept of e-readiness is concerned with being fully prepared to use technology in teaching and learning in nursing education. It involves institutional readiness, student readiness, and teacher readiness. These three mentioned conditions are interrelated, and if one is missing or inadequate, e-learning facilitation and success becomes problematic. In this model, the domain of **nursing student e-readiness** refers to being prepared to adopt e-learning and benefit from its advantages. E-learning readiness for students is determined before teaching institutions introduce e-learning and is concerned with the ability to adapt to technological challenges, collaborative learning, and synchronous and asynchronous self-paced learning. This depends on students having the required motivation and discipline to learn in a self-driven mode and to respond to online instructions. The readiness of the students to use technology involves the availability of infrastructure, clear training objectives, trainer support and guidance, and knowledgeable leadership.

The domain of **nurse-educator e-readiness** refers to the preparedness, knowledge and skills of the educators (as e-learners themselves) to use instructional and technological design in their

daily activities. E-readiness for nurse educators is also concerned with ease of using technology, and necessary investments in infrastructure but also assumes a degree of administration support of e-learning. It is also important to be educationally ready to use e-learning with nurse educators being motivated and having frequent and adequate training. The motivation might be incentives, or other forms of recognition of the job done, as many consider the use of technology as an extra task, and overall nurse educator readiness is about teaching styles and educational needs satisfaction.

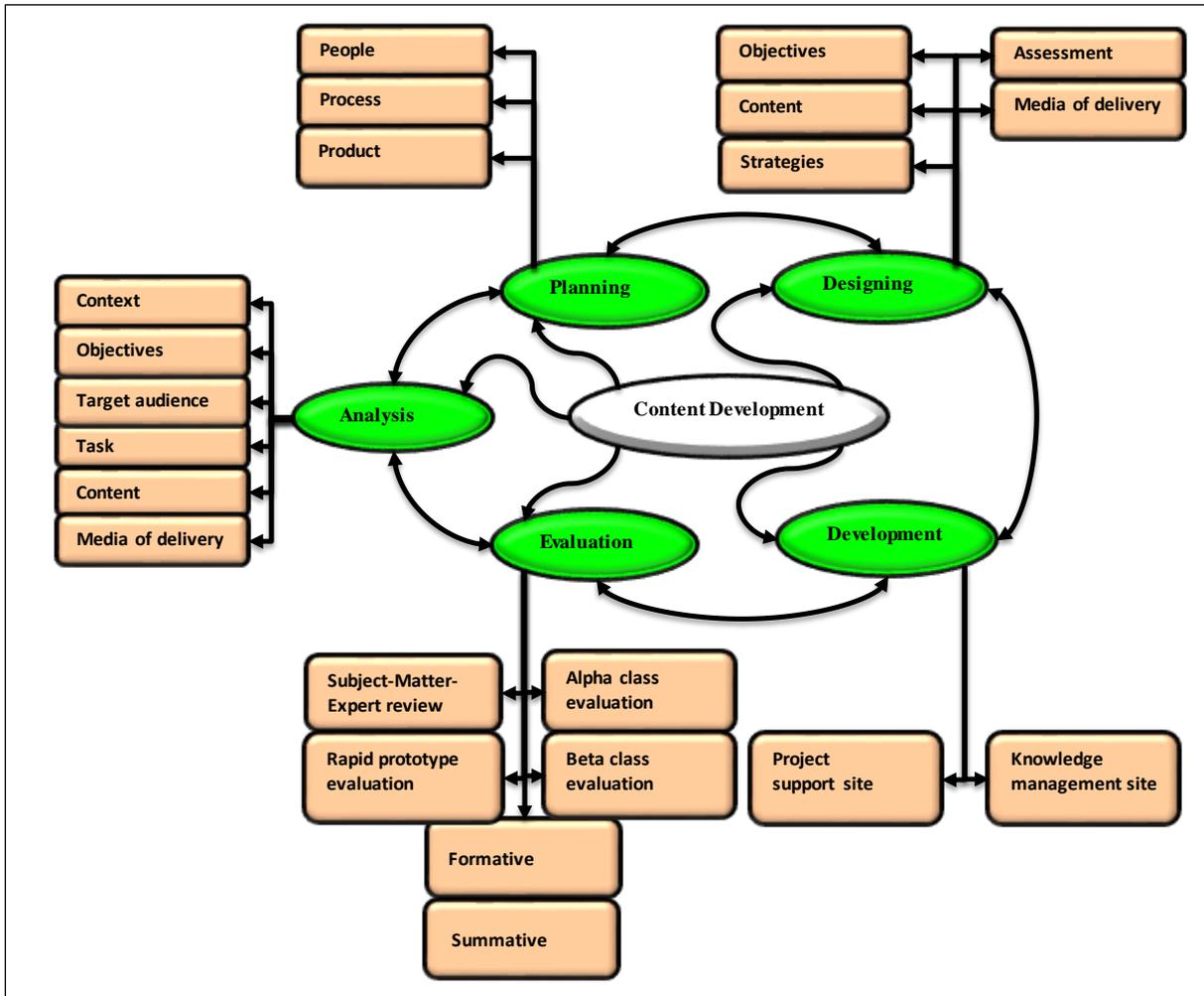
The domain of **institutional e-readiness** refers to how prepared the institution is in using ICT in the education sphere. This involves the **ability of the institution** and the **capacity of institutional stakeholders** (managers, key ICT persons, teachers and students) to generate **e-learning opportunities** by facilitating computer-based technologies, and **how e-ready** the institution is to benefit from educational technology or e-learning.

### **6.5.2 Hybrid teaching and learning (process of course development and delivery)**

In this model, the concept of hybrid teaching and learning is concerned with course development and delivery of e-learning instruction. Putting in place an effective e-learning starts with a wide-ranging analysis of the context, learning outcomes, instructional content and the students. The product of this process includes several stages: analysis, planning, design, development, delivery and evaluation. This process is dynamic taking into consideration constructive feedback, and integrating it into different stages. People who are involved in this process need to contact each other regularly to review the developed materials whenever necessary. The ongoing assessment for perfection needs to be integrated into each stage of e-learning process. The concept of hybrid teaching and learning has two sub-categories, representing two major phases: **(i) Content development and (ii) Content Delivery**.

### **6.5.3 1st Phase: Content development**

The subconcept of content development is concerned with designing all e-learning materials according to instructional design principles and producing a plan that implements those principles for meaningful learning activities. The content development consists of the following domains which represent the stages of content development: analysis, planning, design, development, and evaluation (Figure 6-3).



**Figure 6-3: Content development cycle in e-learning**

**Analysis stage:** The analysis stage involves analysing the "who, what, where, why, and by whom" of e-learning. At this stage, learning goals and objectives are established and the attributes of existing learning context and students' knowledge and skills are identified. It is therefore a broad process and contains many diverse activities involving the following dimensions: needs analysis, students/ target audience analysis, context analysis, task analysis, content analysis, and media selection analysis.

The needs analysis is conducted at the beginning of content development in order to determine whether the educational program is required to provide nursing professional knowledge and skills, and e-learning is the best solution to deliver the training. The context analysis focuses on e-learning possibilities for designing content by taking into account the country vision, health and education trends, instructional and technological requirements. It is important to consider technology limitations, such as insufficient hardware capabilities and low-bandwidth internet connectivity.

The needs analysis provides the identification of general, high-level course **learning objectives**. It is important for learners to have clear goals and objectives, as well as reasonable ways to achieve them. This is because students need to display a high level of participation and success in meeting the goals and objectives of a course, thus making e-learning meaningful. **Target audience** analysis is another crucial step. A careful analysis of students provides important information that is used to design learning activities for the targeted audience. Since e-learning is delivered to anyone, anytime, and anyplace, students may come from culturally diverse backgrounds and differ in how they learn. Information about students' knowledge and skills, personal and social characteristics, capabilities, preferred learning styles, needs, learning context, access to technology, and interests are critical elements of audience analysis. The **task** analysis allows identifying the learning activities to be performed by the students to develop or to reinforce knowledge and skills. This kind of analysis aims mainly at building work-related competencies. The topic analysis should be conducted in order to categorise the **content**. This is essential for developing specific learning and curriculum outlines.

Analysis is also conducted on the **media of delivery**. The analysis of media of content delivery is based on the simple learning content, interactive lessons and virtual classrooms. The simple learning content refers to documents and PowerPoint presentations with no interactivity. The interactive e-lessons are based on text, images, audio, animations and practice. The presentations are made by an expert or instructor and are broadcast in real time or recorded for students to watch at any time. The lessons can be recorded in both video and audio formats (podcasts). In virtual classrooms, the instructor presents the content to a group of students who are connected to the platform at the same time. Students interact with the instructor, ask questions and receive feedback using video conference, audio conference, forum discussion or chat. The instructor uses a special platform such as Moodle, and software called "virtual classroom software". These programs include a range of synchronous tools such as a whiteboard, application sharing, audio conference and chat. Students use these tools to interact with the instructor and other students, ask and answer questions, and be graded.

**Planning stage:** In the planning stage, based on results and information from the "analysis" stage, a comprehensive e-learning plan can be developed which should serve as a "roadmap" that shows the practical steps involved in developing the learning materials for organisational e-learning goals. During the planning stage, the team creates a project plan that clearly

identifies the people, process, and product of each e-learning phase, including, design, development, evaluation, delivery, and maintenance.

In this model, a number of **people** are involved in various stages of an e-learning project, based on the size and scope of the project. Their roles and responsibilities overlap as many e-learning tasks are interrelated and interdependent. A large-sized e-learning project requires the involvement of various individuals. In a small or medium-sized e-learning project, some individuals will be able to perform multiple roles. In this model, when an e-learning course is completely designed, developed, taught, and managed by a single individual, the same individual performs the role of a content expert, instructional designer, programmer, graphic artist, project manager, etc.

Individuals involved in various stages of the content development process of e-learning should be in good communication with each other and revise materials whenever needed. Based on an institution's needs and capacity, technology-based tools and systems are incorporated into the e-learning **process** to enhance its productivity and delivery, and human involvement along with the right tools and systems has the potential for a successful e-learning process.

Each stage of the e-learning process has **products** which can include a project plan, a storyboard, CD-ROM, printed materials, and e-learning materials. The plan also indicates the estimated completion time for each task, the management team, project management skills, budgeting, staffing, and technology requirements. The e-learning project plan provides guidance during the various stages of the e-learning process. E-learning designers, developers, evaluators, instructional, and support staff should follow the guidelines of the e-learning project plan to provide a meaningful learning environment for students.

**Design stage:** The design stage for e-learning content follows a logical and orderly method of organising course **contents** with learning **objectives**, relevant learning **strategies**, **assessment** instruments, and **media of delivery**. At the design stage, the research and design coordinator leads the e-learning course design process. With a comprehensive understanding of students' needs, institutional capabilities, and experience in e-learning design and research, the coordinator is responsible for reviewing course content for pedagogical soundness and the selection of appropriate delivery media. In the design stage, instructional designers work with subject matter experts, interface designers, copyright coordinators, and evaluation specialists. The product of a course design process is the storyboard. During the development of the course

storyboard, the design team communicates with the production and delivery teams for any technical and production-related issues.

Instructional designers are knowledgeable about how to use various attributes and resources of the internet and digital technologies to design e-learning activities. Based on the content types, they can incorporate instructional strategies and techniques best suited for the target audience.

**Development stage:** During the course development or production stage, the production team creates the online course from the course storyboard developed during the design phase. The production coordinator leads the e-learning production process. The production coordinator should make sure the timeline is maintained for all deliverables. It is a collaborative process where each member does his or her own specific tasks for a course. In e-learning, members of the development team can be remotely located. The production coordinator should make sure members are in good communication with each other and in compliance with due dates for their respective tasks. Members should put their work in designated areas on a centralised server or development server. The development server becomes a collaborative workspace for the e-learning members.

In the e-learning content development process, a **project support site** is established to assist members of various e-learning teams to access and share project-related information. The project support site provides a one-stop-shopping node for projects notes, proposals, design standards, graphics, media files, documents, or any other materials that assist the production team in creating e-learning materials for the instructional site. The institutions will be expected to create a **Knowledge Management (KM) system**, which is an ongoing process of identifying, creating, disseminating, and utilising knowledge to serve the individuals within their own institutions and beyond. In this model, involving all the stakeholders is pivotal. Everyone in an institution has something unique to contribute, and the KM system should develop an environment where an individual's knowledge is valued and rewarded and the free flow of ideas is encouraged. Individuals must feel proud to share their knowledge and benefit from the collective wisdom of others. A well-designed KM system means everybody wins. However, if an individual in a workplace does not have job security, he/she may not volunteer to share his or her unique knowledge to the institution's KM.

**Evaluation stage:** The evaluation stage involves cross-cutting between all the stages of e-learning content development. These evaluations are conducted to improve the effectiveness

of e-learning materials. In this model, there are two types of evaluation: formative and summative. Ongoing **formative evaluation** makes it possible to improve the e-learning product as it is being developed. **Summative evaluation** is conducted to do the final assessment of the e-learning products. Because e-learning projects undergo ongoing evaluation for improvement, formative evaluation is inherent in the e-learning development process, and is done through **Subject-Matter Expert (SME) review, rapid prototype evaluation, and alpha and beta evaluation.**

**SME review** is conducted to examine the accuracy and currency of content. More than one SME reviews the course content. Experts provide information about whether the content is complete and accurate and follows a logical sequence based on prerequisites. They also review any graphics and multimedia used in the course in order to provide feedback on their relevance to the course contents.

**Rapid prototype evaluation** is conducted to determine the effectiveness of the overall design of a course by examining just a sample module of that course. Prototypes range from paper-based lessons to online modules. For an online module, the prototype target subject is a representative sample with the diverse background (e.g. familiarity with content and internet technologies) from different locations. Evaluation specialists, design teams, and production teams can analyse the prototype data.

Based on the rapid-prototype evaluation, the production team make changes to the course and conduct an **alpha-class evaluation** to test the effectiveness of the entire course. The production coordinator or a production team member acts as an instructor for this fully developed course piloted on the internet. Based on his or her experience as an instructor, the developer can make changes to the course. If an e-learning course does not require an instructor, then beta-class evaluation is not required. **Beta-class evaluation** is done to test the effectiveness of directions to the instructor. It tests how well the course runs when taught by someone rather than the developer. Beta evaluation is done by an instructor who was not involved in the design and development of the course. The course is offered to students, and in a context that resembles the intended students and environment. Instructional designer and interface designers can assist the evaluation specialist in analysing students' feedback from the pilot testing. With students' feedback, the evaluation specialist communicates with design and production teams for

revising the course accordingly. Development of e-learning and supplemental materials can use these four types of formative evaluation strategies.

#### **6.5.4 2nd Phase: Delivery of e-learning instructions**

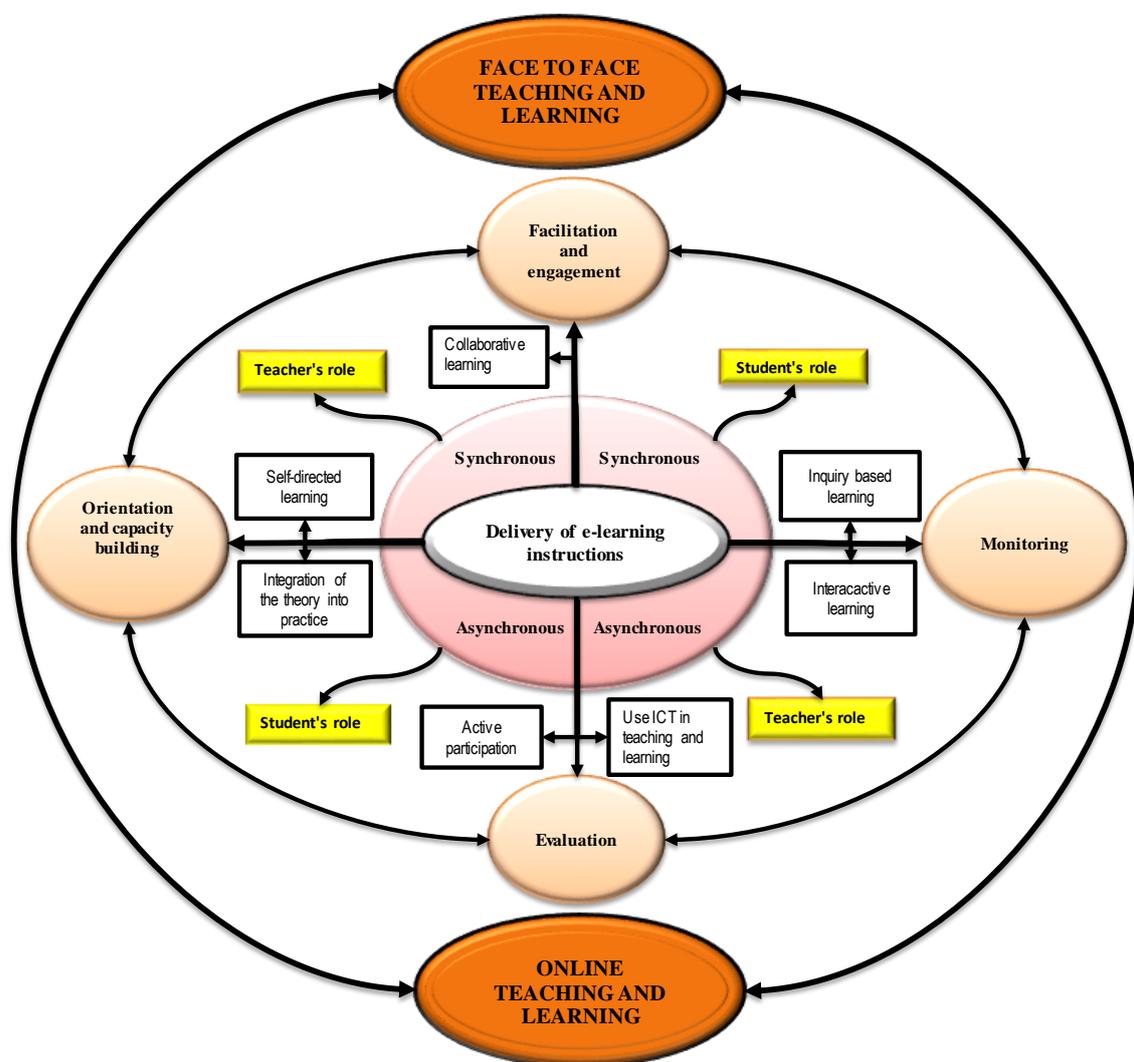
Delivery of e-learning instructions is carried out after the content development. The content that has been developed is distributed to or made accessible to stakeholder groups at any time from anywhere in the world. In this phase, all e-learning content is uploaded to the server. All e-content is hosted on an LMS such as Moodle. All supplemental course materials (e.g. CDs, DVDs, audio and video cassettes, books, course packs, etc.) are also delivered to the stakeholder groups. The delivery of e-learning content is done through hybrid teaching and learning, using student-centred approaches. For successful delivery of e-learning content, students and teachers each need to play their roles in e-learning, either in face-to-face or online interactions. The delivery of content depends on whether the interactions are done in real time or not (synchronously or asynchronously), and a number of teaching tools are provided in relation to the media of delivery. The following are the dimensions of delivery of e-learning instructions: orientation and capacity building of students and novice teachers, facilitation of teaching and learning, and monitoring and evaluation.

#### **6.5.5 Orientation and Capacity Building**

Orientation and Capacity building refers to informing the students about the e-learning courses, orientation of students to nursing education through e-learning and expectations, capacity building and technological support of students and teachers in terms of the technological tools to be used in e-learning. **Informing the students** about the e-learning courses is very important. The students who are interested in e-learning should be aware of the limited face-to-face interaction between teacher and learner and the need for self-direction and autonomy, and the necessity of technical skills is. In discussing educational programs with prospective students, marketing representatives for nursing schools should provide clear descriptions of differences between online and traditional classrooms. The placement of demonstration class modules or tutorials on institutional websites can serve as a trial run in the pre-enrollment phase.

Once a student has made the decision to enrol in an e-learning program, the **orientation of the student to e-learning in nursing education and to expectations** from the program takes place

quickly and includes specific requirements regarding technology, program expectations, and roles for the successful student. Use of standardised orientation programs that students can access after registration helps to prepare students better for coursework. Initial orientation sessions for e-learning courses is conducted in a face-to-face session whenever possible and provides a list of technical criteria designed to screen out students who may be unable to participate, or need a special training due to a lack of computer skills. There is also a need for pre-course orientation and assessment of technical skills, notification of hardware and software requirements, and participation in orientation to online courses well in advance for prospective students and novice students.



**Figure 6-4: Delivery of e-learning instructions in a hybrid teaching and learning environment**

**Capacity building** follows identification of the gaps. Faculty and support staff (such as ICT managers, librarians) should therefore assist students in managing frustrating technical

difficulties. In the capacity building, an emphasis is placed on ICT literacy and the use of an LMS such as Moodle. Students are informed about the requirements of the LMS such as the installation of plug-ins or add-ons, and browser compatibility so that they experience the complete functionality of the system. Lists of these requirements, along with other system tests, should be visible on the log-in page for an LMS. Technical support should be provided to students and teachers regarding the hardware and software to be used in e-learning, such computers, projectors, video and photo cameras, hard drives; operating system, memory, processor speed, necessary bandwidth, hard-drive space, and minimum display resolution. Software requirements in e-learning courses should focus on the use of common applications, such as word processing, spreadsheets, and presentation software.

Students who enrol in e-learning are advised about the amount of time they can **expect** to spend in class **participation** and **preparation**. In this model, 40% of the time allocated to a module is taught face to face, while 60% is taught online, in accordance with the hybrid teaching and learning approach. Per week, students need to spend two hours per course credit hour in study and preparation. Online students who are performing the bulk of reading, studying, and assignment preparation may require more time. To highlight the need for student engagement, faculty members must be clear about **criteria for student participation in courses**. For example, the use of **discussion forums** can serve as a means of increasing student-student interaction, fostering a sense of community along the way. By providing clear instructions regarding minimum requirements for the quality, timeframe and length of postings to discussion forums, instructors can assist students in both prioritising and preparing assignments. Providing a list of guidelines for netiquette in the course framework can help students to understand the role of a course member.

#### **6.5.6 Facilitation of e-learning activities**

Facilitation of e-learning involves instructor activities that help to guide students, facilitate discussions, recommend resources and areas of investigation. The hybrid teaching and learning adopted in this model, focuses on a number of activities which are conducted through the teachers' facilitation and student's engagements, based on student-centred approaches. These activities include presentations, demonstrations, tutorials, storytelling, games, simulations, role-play, discussions, interactions, modelling, debates, field trips, apprenticeship, case studies, reflection, peer evaluation, portfolios, learning contracts and projects.

**Presentation:** Presentation refers to a set of techniques for presenting facts, concepts, procedures, and principles. An e-learning presentation can be designed using a variety of methods such as text, PowerPoint slides, pictures, audio/ video clips, and videoconferencing. Additional (offline) resources such as print-based materials, audio, compact discs and so on can be mailed to students. The presentations done online need to be simple, and the screen should not be overloaded with the text and the graphics. It is important to ensure that presentations developed using special software are supported by various hardware and software.

**Demonstration:** Demonstration refers to display or simulating how something works. Demonstrations can be used in e-learning in areas such as teaching procedures, indicating how to operate equipment, exemplifying principles, and demonstrating interpersonal skills. The demonstration can be used with roleplay, case-based studies and simulations.

**Tutorial:** Tutorials relate to a presentation-response-feedback format often used for presenting how-to procedures in the context of a worked example. Online tutorials to be concerned with the presentation of the contents, asking questions to students, and providing feedback them. Tutorials may occur in one-to-one encounter with a student, an encounter with three, four, or more students and a teacher. The purpose of the tutorial group will largely determine its organisation; a one-to-one tutorial is related to individual student progress and comments upon specific aspects of the student's work. The same kind of function is achieved with three or four students together.

**Storytelling:** Storytelling refers to a narrative technique that can be used effectively in e-learning for all cultures. For educational purposes, storytelling helps the students to have unforgettable information. Students benefit greatly from listening to each other's stories or to stories from the teacher. Storytelling promotes a peer-teaching approach providing a forum to enhance learning, correct misinformation, and validate personal experiences.

**Simulations:** Simulations are artificial recreations of real-life situations. The teacher organises the simulation by providing an authentic environment that simulates a ward setting, with a patient in a bed, a locker, charts, etc. Certain staff or students are designated roles such as nurse, midwife, relatives, and the whole scenario is enacted of what happens when a patient has a given condition. The scenario is used to give student nurses an insight into how the procedure

operates and, in this instance, would serve as a demonstration. Simulations help the students develop critical thinking and decision-making skills.

**Role-play:** Role-playing is used to represent authentic scenarios that facilitate students to practice situations experienced in the real world. Role-playing allows students to learn social skills such as communication and interpersonal skills. Role-play can be an excellent way of creating empathy with other people's points of view, particularly if the student is given a role that is opposite to the position or viewpoint currently held. This counter-attitudinal role-play forces students to consider issues and feelings from the other person's point of view and can help them to gain insight into why that person's behaviour is occurring.

**Games:** In this model, games are a highly motivational instructional device to help students improve various skills such as decision-making, problem-solving, and interpersonal communication. In a game, students follow prescribed rules to attain a challenging and compelling goal. Gaming is closely related to simulation and role-play, but differs from simulation in that it has very precise sets of rules and is usually competitive in nature. Unlike simulation, games have no scenario, being complete in themselves, and participants behave as their normal selves. Educational games are simply extensions of recreational games, such as board games, card games and quizzes, and the aim is to create a method of learning that is both enjoyable and beneficial.

**Discussion:** Discussion allows the students to share the information with their peers and teachers. In the discussion, students need to have shared goals. An effective discussion promotes creativity, interactivity and participation of the students. In a forum discussion, various points of views motivate students to explore new ideas, thus helping them to become critical thinkers. The online discussion can take different forms such asynchronous where information is sent and received at different times through emails and newsgroups, or synchronous where the information is sent and reviewed at the same time through audio-video conferencing, social, messaging tools. In e-learning, the forum discussion can be moderated, unmoderated, or topics outside the professional discussion.

**Interaction:** Student interaction occurs when students interact with each other, with teachers, and with online resources. Teachers or experts who act as facilitators guide the communication and provide the feedback either asynchronously or synchronously.

**Modelling:** Modelling portrays the required behaviours, and the preferred level of performance. In e-learning, the teacher can post sample interactions, projects and assignments and provide the indispensable modelling prospects of the subject requirements. The experts modelling can be done by demonstrating how a specific issue can be solved, or how a particular situation can be managed.

**Debate:** In e-learning debates are used to establish an authentic teaching and learning atmosphere. Debate on divisive problems assists students to have a constructive experience through their active engagement. It is required that students take a position and have to provide arguments to defend it. Debates should promote an honest and a tolerant learning environment, and the agreed-up rules should be established. Videos, audio and images can be incorporated into debate discussion. Note taking is required in debates where students can write about their views and the opinions of others.

**Field Trips:** Field trips are activities that facilitate students to discover and have insight into the new environment, or things. In e-learning, field trip via the learning management system can allow the teacher to provide to the students a guided tour to the different institutional websites such the hospitals, health centres, universities' websites as if he was taking the students in the real field trip. There is a need to establish the purpose of the field trip in order for the students to collect adequate information as part of their assigned activities.

**Apprenticeship:** Apprenticeship provides to students an opportunity to observe, explore, model and work together with the teachers or the experts in order to perform a given task. In e-learning, the use of ICT facilitates the student to be in an authentic learning situation. The apprenticeship should help the student to have an ongoing communication between the teacher and the student, thus enabling the students to have greater competencies in the area of interest.

**Case studies:** Case studies refer to authentic or simulated circumstances developed for learning purposes. In e-learning, case studies should assist students to have an in-depth learning and engagement in the accurate problem-solving activities. Case studies should be based on the real situations that the student is likely to encounter in their clinical settings. Effective cases are linked to goals of the subject being taught, for the students to have maximum benefits from them. It is imperative to group students in small groups or pairs and allow them to share cases and discuss their point of views. Students may be required to share their opinions with a visual presentation, and cards to the entire class.

**Reflection:** Reflection encourages students to reflect on their learning during activities that facilitate deep learning. This can be done by requesting the students to create a portfolio or a reflective journal. It can also be done by encouraging the students to share knowledge and perception about the content, then discuss with their colleagues and write a paragraph summarising their learning. The summary can be presented using graphics or presentation which sum up their learning. Later on students may be requested to share their ideas with others.

**Peer evaluation:** Peer evaluation allows the students to be responsible for their own learning as they play the role of the evaluator. It helps the students to learn from each other's weakness and success. For effective peer evaluation, the teacher establishes the guidelines and rules. A checklist may be provided in order to make it easier for the students to evaluate their colleagues' works. This can be done by individual students or by small groups.

**Portfolios:** Portfolios used in an experiential e-learning context (including interpersonal skills training, and work-based learning) are a valuable learning strategy because they valorise experience as a source of learning; they allow the students to reflect on their practices, they contain evidence of the students' experiences and accomplishments. Proper guidelines should be provided to the students so that they have a good understanding of how to complete the portfolios. Portfolios promote professional and individual growth.

**Learning contracts:** Learning contracts are an effective tool for developing student autonomy in practice placements. It is useful to meet with students prior to the placement to begin the initial contract negotiation, and this can be modified as required once the placement has begun. Students establish a learning plan and goals, and prior to completing the learning contracts, clear explanations should be provided to the students. Learning contracts can help bridge the gap between the theory and practices.

**Projects:** Projects are purposeful experiences in which the educational needs and interests of the student determine the aims and objectives of the activity and guide its process to a conclusion. In a project, students are very much involved in the formulation of the aims and objectives of the project and are actively participating in the learning experience. Projects may be done by individuals or by a small group of about six members. In projects, the main topics can be suggested by the teacher or left completely to the student's imagination, but in both

cases it is crucial for the teacher to ensure that the aims of the project are clarified, so that the students are in no doubt as to the purpose of such an exercise.

### **6.5.7 The role of the teachers in e-learning**

The role of the teacher in e-learning emerged as an important dimension. In e-learning, the teacher plays a number of roles which can be classified as pedagogical/intellectual roles, social roles, managerial/organisational roles, and technical roles.

**Pedagogical or intellectual roles:** Pedagogical or intellectual roles are important for the online learning process. The e-learning, the use of questions that stimulates focus discussion is very important. The discussion should be on the important aspects of the course, concepts, principles and skills. Pedagogical or intellectual may include: initiating the discussion, directing the discussion on the important aspect of the course, and facilitating the discussion and debates. The teacher motivates the students and gets them involved in the classroom activities. The teacher may provide summaries and interpretation of the online discussions. In pedagogical roles, the teacher plays the role of designer, through designing worthwhile learning task ('pre-course' activity), and of content facilitator, where he or she facilitate the learners' understanding of the content ('in-course' activity). The teacher is a researcher who creates new knowledge relevant to the content, and an assessor who provides grades and feedback to students.

**Social roles:** Social roles involve the establishment of the pleasant and contented environment where students feel comfortable to learn. In e-learning, the teachers provide a platform to the students where they introduce themselves. The teacher needs to involve those who are discreet and reluctant to participate, by making sure that an effective communication is taking place. The teachers should take into accounts the socio-cultural factors, minimise the disruptive behaviours, and facilitate collaboration among the students. Within social roles, the teacher plays the role of advisor and counsellor by providing students with advice or counselling on a one-to-one basis.

**Managerial or organisational roles:** Managerial or organisational roles involve establishing the ground rules teaching and learning. The teacher set learning objectives, design the timetables for the activities to be performed by the students, and he clarifies the procedures and standards to be respected. In the managerial roles, the teacher encourages the students'

participation, and he ends the session. Within the managerial roles, the teacher plays the role of manager through administration and record keeping. He plays the roles of a process facilitator by establishing a learning community, handling the overload of information; facilitating communication, modelling good social behaviour and norms. The teacher plays the role of a manager through administration and keeping records.

**Technical roles:** Technical roles involve becoming accustomed, contented and skilled with the use of ICT systems and software that are used in e-learning. Moreover, this role comprises assisting the students to become knowledgeable and skilful in using ICT tools by offering technical support such as providing the study guides, instructions and feedback on various technical issues. Within the technical roles, the teacher plays a role of the technologist.

### **6.5.8 Students' engagement**

In this model, students' engagement emerged as an important dimension. It relates to the degree of attention, inquisitiveness, attention, confidence, and motivation that learners express when they are studying or being taught, which extends to the level of motivation they have to learn and progress in their education. Students' engagement depends on student-centred approaches which support self-directed learning, collaborative learning, inquiry-based learning, interactive learning, use of ICT in teaching and learning, active participation, and putting theory into practice. **Engagement with e-learning instructions** occurs when students are actually receiving instruction and facilitation, and this is done in either **face-to-face** or **online** interactions in a **hybrid teaching and learning process** using **student-centred approaches**. In online interactions, engagement with the students is done **synchronously** or **asynchronously**.

In **synchronous** engagement with e-learning instructions, students engage in real time through instant messaging, live chat, webinars or videoconferencing which allow students and teachers to collaborate and learn in real time. In **asynchronous** engagement, the information is shared among a network of people, outside of real time and place. In asynchronous engagement with e-learning instructions, communication is done through email, electronic mailing lists, threaded conferencing systems, online discussion boards/ forums, chatting, wikis, and blogs; Moodle as the learning management system will facilitate discussions, posting and replying to messages, and uploading and accessing courses and multimedia.

This model puts an emphasis on the use of student-centred approaches which allow the students to be the master of their learning. In the model, **self-directed learning** skills can be developed and promoted within a hybrid teaching and learning environments through careful design of interactive tools that encourage self-management, self-monitoring and motivation. In the process of interaction with e-learning instructions, individual students are encouraged to take more responsibilities in their learning activities.

**Collaborative learning** occurs during the interactions of the students, either peer-to-peer or in large groups. During engagement with e-learning instructions, collaboration can be done in Moodle through forum discussion, chatting, and communication with peers or teachers through emails or social networks. This is because two or three heads are better than one, and through peer instruction, students teach each other by addressing misunderstandings and clarifying misconceptions. During engagement with e-learning instructions, collaboration indicates the active involvement of teachers, students, and peers in an academic constructive way.

**Inquiry-based learning** is a form of discovery, allowing the students to reflect, observe and explore, plan and predict and thereafter experiment and reflect. During engagement with e-learning instructions, students collect information from various sources, and critically analyse them, and later take decisions. Inquiry-based learning is also done through the questions asked in the forum discussion, online discussions, or assignments (individual and group assignments) where students have to find information from a number of sources in order to respond to the task given.

**Interactive learning** is a way of engaging the students, and keeping them motivated for a better understanding of the lesson. Interactive learning promotes purposeful exchange and confrontation of ideas through the involvement of peers and or teachers, and all students have an equal right to contribution. Interactive learning is achieved by making lessons more interactive through the use of videos, pictures, animated PowerPoint, forum discussion, and chatting, including web links which may attract the attention of the students. Interactive learning is also achieved through participative group discussion, brainstorming, small group discussion, and case scenarios.

Engagement with e-learning instructions requires the teachers and students to use **ICT tools in teaching and learning**. These tools include (but are not limited to) computers, and computer programs, internet, learning management systems such as Moodle, social media, phone,

automatic screen recording, and videos. Engagement with e-learning instructions focuses on **active participation** of adult students in their own learning. This is done through active participation in the learning process in partnership with teachers and other students. Students' contributions are accepted with respect by other students and the teacher, and the challenges and debates will be part of the agenda. The active involvement is achieved through face-to-face and online interactions. In engagement with e-learning instructions, and in **putting theory into practice**, the students become agents of change by using evidence-based practices. The integration of theory and practice allows students to provide care that is patient-centred while being critical and creative thinkers, and linking what they studied in theory with clinical practice. It is expected that nursing students, based on their working experience in clinical areas, will bring the experience they have accumulated throughout the years into the classrooms which makes the course more interesting, and that they would also use the knowledge acquired from the school to change malpractices in their respective working settings.

### **6.5.9 Roles of the student in e-learning**

In this model of e-learning in nursing education, the roles of students in e-learning emerged as a dimension related to student engagement, grouped as intellectual engagement, emotional engagement, social engagement, behavioural engagement, physical engagement and cultural engagement.

**Intellectual engagement:** In intellectual engagement, students are self-directed in taking responsibility for their own learning; and they use their accumulated experience which serves as a source of information for their own learning. In e-learning, students have a life-centred orientation involving problem-solving and task-centred approaches. Students are involved in higher-order thinking (analysis, synthesis, evaluation), and engage in activities (e.g., reading, discussion, research, writing) using available technological tools. Awakened the students' curiosity is important as it increases their engagement in the learning process and help integration of the learned theories with actual practice.

**Emotional engagement:** In emotional engagement students need to be highly motivated. Students are requested to work with their teachers, following approaches that promote positive emotions and minimises the negative behaviours. Students are requested to seek advice, mentoring and guidance from the institution for academic and non-academic issues. To succeed academically they need to feel optimistic, excited, and positive about the academic life.

**Behavioural engagement:** In behavioural engagement in e-learning, students play roles that foster behaviours that are more conducive to learning. Students have to comply with group rules or instructions, as they may be requested to form small groups or join together in cycle for a group discussion or rotate according to activities. The students have to respect the time management for each academic or non-academic activity assigned to them. They must be independent; active learners, self-starting and self-directed, and they must possess good organisational and time-management skills and make the school the priority for the duration of the program, in order to complete work in a timely manner that doesn't obstruct other commitments. Students need to respect school property (technology-related or otherwise) and abide by the ethical guidelines of studying in nursing education through e-learning such as avoiding plagiarism and respecting the copyright of academic work.

**Physical engagement:** Through the property of physical engagement in e-learning, students are required to do physical exercises during their school activities. For example, during face to face and online teaching, students may be requested to have small breaks and walk around to reduce antsy, fidgety, or distracted behaviours.

**Social engagement:** In social engagement in e-learning, students may be put in groups in academic and non-academic activities, debates, dance clubs which bring together learning experiences and social interactions. Effective communication is very important for the students during social engagement. Furthermore, students need to take initiatives to facilitate and assess their colleagues constructively in either face-to-face or online interactive sessions. Students need to respect their colleague opinions, and avoid comments or insults which may negatively affect colleagues in face-to-face interactions, emails, chatting, or forum discussions. Involvement in the community activities, active participation in social causes can enhance students' engagement.

**Cultural engagement:** In e-learning, students from diverse cultural backgrounds feel welcomed, accepted, safe, and valued, and this is done during the orientation period. Students from different background may be requested to share their experiences. The teacher may purposefully adjust the lessons to incorporate the history, religion and the perspectives students background. This is because the purpose of these approaches is to avoid the exclusion of some students, and feeling of confusion, thus enhancing their engagement in the academic activities.

### **6.5.10 Monitoring of e-learning**

In this model, monitoring of e-learning emerged as a dimension of delivery of e-learning instructions. Ongoing updating and monitoring is a major part of the e-learning maintenance process. In this model, monitoring includes follow-up and tracking the activities of students in terms of what they are learning with the e-learning, and ensuring that teaching resources are updated frequently. Moodle as a learning management system serves as a tool to monitor the activities of the students and the teacher's facilitation process. For the students and teachers, this is done through participants' course blogs, forum posts, activities schedules, notes, log reports, live log reports, activities reports, course participation, activity completion, grading and statistics. Monitoring of e-learning is also done through face-to-face interactions, where teachers may assess the level of acquisition of competencies, find gaps, and collaboratively with the students find solutions and plan a way forward.

In monitoring of e-learning, individuals are assigned with responsibilities in all stages of course delivery and in supervising the entire delivery process (orientation, capacity building, facilitation, engagement, monitoring and evaluation). This process is facilitated by the use of an LMS that contains courses and instructional information. Through this platform, students, teachers, ICT managers, campus managers and visitors can get information about the institution, the program, and courses. Although the LMS is open to visitors, only registered students, teachers, ICT managers, and other stakeholders who have been granted permission will be able to access the courses with the usernames and passwords. Monitoring an instructional site (Moodle) includes the coordination of services of instructional, administrative, and support services staff. It is imperative to monitor technological tools, and infrastructure used in e-learning and keep them up updated and accessible. On-going training of teachers and students is crucial to the success of e-learning.

### **6.5.11 Evaluation of instructions**

In this model, evaluation of instructions is a dimension of delivery of e-learning instructions. Evaluation of instructions for e-learning should focus on how all the stakeholders such as students, teachers, campus managers, ICT managers, experts, and the community it serves feel about the overall performance of its e-learning offerings. Therefore, institutions should develop appropriate evaluation methods. The evaluation of instructions in e-learning focuses on course

offerings, student support, administrative support, program, and institutional levels, and students' assessment.

Course offering evaluation includes evaluation of the performances of the instructional team ICT managers, support services staff and administrative services. Students may be requested to complete an evaluation form, in order to evaluate the members of the instructional team such teachers. Apart from the students' feedback, the assessment of asynchronous and synchronous participation may provide information about the performance of the teachers and support services.

Evaluation of e-learning at program and institutional levels can be done through analysis of the professional development, certificate, and degree programs, and other centralised services. The analysis of the students' feedback is helpful to get an understanding of the e-learning delivery. There is a need for a comprehensive evaluation of e-learning at the institution by taking into consideration the resources, the learning environment, and the performances of everyone involved in e-learning at different stages.

The assessment of the students should be based on the authenticity, the formats such as multiple choice questions, essays, quizzes, case studies, projects, electronic portfolios; and test/exam characteristics. It is important to set evaluation criteria in order to get evidence that the learner has achieved the specific outcome. The evaluation of the students' achievement in a hybrid teaching and learning environment can be done through face-to-face or web-based evaluation. A number of assessment tools can be integrated into e-learning subjects such as forum discussions, individual and group assignments portfolios and projects. In this model, **formative assessment and summative assessment** are provided in order to assess the level of achievement of competencies of the students.

**Formative assessment** is an ongoing process that facilitators are involved in at two levels, formal and informal. It reflects the way facilitators absorb information and evidence related to student learning and how they use it to inform their future teaching sessions, whether this is the next task or a series of tasks. The objective of this form of assessment is to promote effective further learning by students. It may be achieved in a variety of ways: giving students helpful feedback, giving the facilitator feedback, and identifying students' future learning needs. The main focus of formative assessment is to identify errors, difficulties and shortcomings in

students' work. It also informs the tutor of the nature of advice and information needed to be given to the students so that they can improve their future learning outcomes.

**Summative assessment** is directly related to accreditation of knowledge or performance. In this form of assessment, the student is certified for his or her achievements. This occurs through a variety of examinations. Summative assessment takes into account a variety of components such as written assessments, project work, observation, and teachers' evaluations. In such cases, judgements are made and judgemental assessment or summative assessment occurs, thus producing a decision for the record. Such a decision would reflect whether or not the individual has reached the required standard. The summative assessment identifies the standard of attainment achieved by an individual at a given moment in time, normally carried out at the end of a period of teaching or instruction. This would include end-of-module exams, and end-of-course/programme assessments. The outcomes of such assessments are typically grades, or percentages used by schools, faculty or departments to determine the level of attainment, degree of classification or conferment of a research project.

## **6.6 OUTCOMES**

In this model, e-learning is associated with a number of outcomes, associated with the following sub-concepts: quality nursing and midwifery education, fast-track production of nursing and midwifery workforce, increased nursing and midwifery workforce, improved quality care and services, collaborative partnership, lifelong learning.

### **6.6.1 Quality nursing and midwifery education**

In relation to quality nursing and midwifery education, it is expected that the implementation of the middle range theory of e-learning in nursing and midwifery education would result in producing competent nurses and midwives who are able to respond to health-related issues of the society. Effective use of an e-learning platform will undoubtedly raise the quality of education, since e-learning promotes student-centred approaches where students are self-directed, learn collaboratively and do research, and which in return promote inquiry-based learning. In this way, students and nurse educators will become familiarised with technology such as computers, internet, learning management systems and ICT in general, enabling them to access updated information anytime and anywhere, which will help them when they graduate to provide evidence-based practice. In this model, nurse educators help students to become

competent qualified nurses. E-learning provides a learning environment where time and locations do not pose problems to the students. The expectation in this model is that students and teachers will acquire professional and personal development and growth in terms of using student-centred approaches such as adult learning, self-directed learning, active learning, critical thinking and collaboration. Adult learners are goal-directed and responsible for their learning. It is expected the proper use of e-learning platform will enhance integration of theory and practice in order to promote evidence-based practice and nursing education that is responsive to national policies and laws.

### **6.6.2 Fast-track production of nursing and midwifery workforce**

Fast-track production of nursing workforce as an outcomes subcategory in the model relates to the view that e-learning in nursing and midwifery education is a tool to exploit at the maximum the benefits of innovative teaching approaches and technologies to educate healthcare professionals.

It is expected that the adoption of innovative, technology-enabled models in health professional education, will augment capacity to scale up production, enhance quality and relevance of training, and adopt equity-focused policies. It is expected that the number of nurses and midwives joining nursing schools through e-learning will increase, thus increasing the number of nurses graduating each year. This is because e-learning is viewed a flexible tool that gives nurses the chance to upgrade their level of education, irrespective of age or location and without leaving their jobs in the process of phasing out A2 nurses (with diploma level) in favour of A1 nurses (with advanced diploma).

### **6.6.3 Increased nursing and midwifery workforce**

The increased nursing and midwifery workforce outcomes subcategory in the model reflects the expectation of an increase in the nursing and midwifery workforce in short period of time and in a resource-constrained context that will bridge the shortage of qualified nurses and midwives in various clinical settings. This is because health systems in the 21st century need adequate staff capacity to respond to the needs of the population. E-learning in nursing education is an effective enabler to improve the health of populations, both directly and through improved health workforce capacity and accessibility.

#### **6.6.4 Improved quality of care and services**

The improved quality of care and services outcomes subcategory in e-learning in nursing education reflects the fact that quality and services improvement initiatives are driving significant changes in the healthcare system in Rwanda. It is expected that the graduates will be able to deal with all health need at all levels of the health sector in Rwanda. The health system in Rwanda is a pyramidal structure with five levels: national, district, sector, cell and village. The health sector is led by the MoH, which, through the Rwanda Biomedical Centre (RBC), supports, coordinates and regulates all interventions aimed at improving the health status of the population. It is expected that students who are enrolled in e-learning will be able to provide services at different levels of the healthcare system (community, health post, centre, district hospital and referral hospital) and by different types of providers (public, private, NGOs and traditional medicine). Having enough qualified and competent nurses will be of a great value in dealing with health-related issues at all levels, due to the knowledge and skills they will have acquired from the e-learning system.

#### **6.6.5 Partnership and collaboration**

The partnership and collaboration outcomes subcategory in the model relates to more formal and long-term arrangements. Authentic partnership not only ensures commitment and acknowledgement of responsibility by all parties involved, but it is also significant in promoting and monitoring the quality of the educative process, ensuring that learning experiences are meaningful and beneficial to both students and teachers. Collaboration and partnership bring stakeholders into a relationship of shared commitment to a joint purpose. A well-defined communication is required for a such collaboration. Collaboration between universities has become important for sustainable educational development. In the context of Rwanda, collaboration is important in the implementation of e-learning, involves the joint effort by nursing schools; the National Council for Nurses and Midwives; the Council for Higher Education; the Ministry of Health, the Ministry of Education, and other stakeholders such as Rwanda Human Resource for Health (RHRH). This joint effort is manifested in planning, implementing, and monitoring of e-learning platform.

### **6.6.6 Lifelong learning**

The lifelong learning outcomes subcategory in the model reflects the potential for e-learning to equip students with lifelong technological and learning resources – enabling them to address real community problems – which they acquire through experiencing and engaging in learning in practical ways rather than merely focusing on theoretical knowledge. Putting into practice in various clinical settings the theory acquired from the classroom facilitates lifelong learning through the acquisition of transferable learning experiences. Through e-learning, students and teachers acquire transferable skills in terms of using science and technology (in particular the e-learning platform) and showing critical responsibility towards nursing and midwifery and the health environment.

In lifelong learning, transferable skills help the students to engage in proactive actions. Transferable skills are core skills that students need to develop in their academic life which will be essential in their future careers. Both collaborative and experiential learning environments assist students in acquiring concrete knowledge, developing ability to communicate, being open to learning new skills, working in a team, solving problems, adapting knowledge to new situations with minimum supervision, understanding ethical implications of decisions, questioning, thinking logically, creatively and critically, making transferable analysis and taking responsibility.

## **6.7 RELATIONSHIPS AND STRUCTURAL REPRESENTATION OF THE MODEL**

Theories and conceptual models are sets of relational rules in which various concepts related to the core category describe or explain the phenomenon of interest and show interrelationships among the concepts (Chinn and Kramer, 2008; Chinn and Kramer, 1999; Strauss and Corbin, 1990). Chinn and Kramer (2008) state that relationships address the way concepts are interrelated together, and emphasis on the various forms relationship statements can take and how they give structure to the theory.

Chinn and Kramer (2008) state that there should be a structure in the theory that addresses the overall form of the conceptual interrelationships. The authors further explain that the structure distinguishes whether the theory encompasses partial structures or has one basic form, and can be presented diagrammatically, in order to clarify the relationships of the concepts through a symbolic representation (see Figure 6-1).

The structure of the model depicts the context of nursing education within which e-learning is the core phenomenon. E-learning in nursing education is conceptualised in four different ways: as a mechanism to advance a political agenda, as a student-centred approach, as blended learning, and as a tool to open up access to education for working nurses and midwives. They are interrelated as they all depict e-learning as an innovative and active process with a potential to produce a change in nursing education. E-learning in nursing education is **a mechanism to advance a political agenda** in being in line with the national vision, and in aiming to provide guidelines that can be used to foster professional development and guide practitioners with an interest in evidence-informed practice using technology. E-learning as **student-centred approach** promotes self-directed learning, encourages collaboration, inquiry-based learning, interactive learning, use of ICT in teaching and learning, active participation, and integration of theory and practice. E-learning ensures that both instructional and technological designs are harmonised to produce competent nurses. **Blended learning** relates to the hybrid facilitation of e-learning, in which teaching and learning occur both in face-to-face and online forms. E-learning is **a tool to open access to education for working nurses and midwives**, for students from rural or remote areas, for students with family responsibilities, and for students with financial challenges. E-learning will help to upgrade nurses on a large scale from diploma level (A2) to advanced diploma level (A1) for rapid response to the needs of the country. E-learning will improve nurses' and midwives' knowledge and skills using modern methods of teaching and learning, and will equip different health settings with well-trained and qualified nurses and midwives.

E-learning is presented as the platform within which the teaching and learning environment is situated in the nursing education **context**. There are two lines which represent that the context may refer to a particular discipline, and in this model, the contexts referred to are **instructional** and **technological contexts** in nursing education, represented by **two broken lines** which indicate that the context of e-learning in nursing education is influenced by **factors from within the actual context and from outside** of the context.

The concepts of catalysts and **hybrid teaching and learning (course development and delivery)** presented after the contextual structure of e-learning, represent the **process of e-learning**. For successful e-learning the two processes are interrelated. At **catalyst process** level, there is institutional support for students and teachers, based on instructional and technical design, which later will lead to hybrid teaching and learning. At this catalyst level,

there is also partnership and collaboration, policies and regulations for e-learning, effective working learning management system, e-readiness (of students, teachers and the institution), and bridging the digital divide (political commitment, early socialisation to ICT, and emotionally mature students).

The **hybrid teaching and learning process** represents the actual facilitation of teaching and learning in two phases: course development and course delivery. The content development phase consists of activities including analysis, planning, design, development, and evaluation. The content delivery or implementation phase consists of activities including orientation and capacity building, facilitation and engagement, monitoring, and evaluation in a hybrid teaching and learning environment.

The intended outcome of this is to enhance the quality of nursing education, fast-track the production of a nursing workforce, increase the size of the nursing workforce, improve nursing care and services, enhance collaborative partnership, and encourage lifelong learning.

## **6.8 ASSUMPTIONS OF THE THEORY**

According to Chinn and Kramer (2008), assumptions are the basic givens or accepted truths that are fundamental to theoretic reasoning. The authors further note that assumptions may take the form of factual assertions or may reflect value positions. Factual assertions are those knowable or potentially knowable through perceptual experience (Chinn and Kramer, 2008). Value assumptions assert or imply what is right, good or ought to be. This addresses basic truths taken to underlie theoretic reasoning, and it questions whether assumptions reflect philosophic values, factual assertions (Chinn & Kramer, 2008).

The assumptions that formed the basis of the presented model of e-learning in nursing education relate to the way e-learning in nursing is conceptualised in context: e-learning as a mechanism to advance a political agenda; e-learning promoting student-centred approaches, self-directed learning, collaboration, inquiry-based learning, interactive learning, and integration of theory and practice. E-learning in nursing education is blended learning that is facilitated by online teaching and learning, face to face teaching and learning, and use of ICT in teaching and learning. E-learning in nursing education is viewed as a tool to open access to education for working nurses and midwives. This is because it is time-saving, cost-effective, and allows access to resources anytime and anywhere. Thus e-learning helps to upgrade the

lower level of qualification in nursing from A2 (Diploma) to A1 (Advanced Diploma), and decreasing the shortage of skilled and competent nursing workforce.

It also assumed that in the context of e-learning in nursing education, in a resource-constrained environment catalysts or agents of change are crucial such as institutional support for nursing students and nurse educators (instructional and technological), partnership and collaboration, policies and regulations of e-learning, effective working LMS, e-readiness (students, teachers, institutions); bridging digital divide (political commitment, early socialisation in ICT, emotionally mature students). In the presented model, it is assumed that an adequate process should be in place for e-learning in nursing education to achieve its goals. The facilitation and engagement process in e-learning is based on a hybrid mode that combines both face-to-face and online teaching and learning. This hybrid teaching and learning is done through course development and delivery or implementation. It is assumed that in course development a number of activities will be performed such as analysis, planning, design, development, and evaluation. In the content delivery or implementation phase, a number of activities will also be performed such as: orientation and capacity building of students and teachers, facilitation and engagement activities, monitoring, and evaluation.

It is assumed that adequate e-learning will promote quality nursing education, rapidly produce a large increase in the nursing workforce, improve the quality of care, enhance collaborative partnership, and promote lifelong learning. In this model, it is also assumed that this requires linkage with the contextual structure of e-learning, catalysts or agents of change, hybrid teaching and learning through course development and delivery, and outcomes. Finally, the developed model is based on the assumption that there are internal and external factors to the context that should be taken into consideration. The internal factors assumed are socio demographic characteristics of the nursing students and nurse educators, constraints encountered while using e-learning, pedagogical and ICT literacy, and language literacy. The external factors assumed are the changing nature of national health and educational policies, national health imperatives, and sub-regional and global trends in health and education as indicated above by the broken lines in the structure and relationship.

## **6.9 SUMMARY OF E-LEARNING MIDDLE-RANGE THEORY**

The e-learning middle-range theory in Rwanda was developed as an explanatory theory using grounded action research for the purpose of generating new knowledge about e-learning in

nursing education in Rwanda. The main purposes of this middle-range theory are: (i) To provide a framework that can be used to foster professional development and guide practitioners with an interest in evidence informed practice using technology; (ii) To provide guidelines that can be used in the establishment of a supported network learning space through critical reflective skills by using technology in teaching and learning, and to support nursing education challenges in a fluid and dynamically changing practice context; (iii) To provide an instrument that can be used to widen access to nursing and midwifery education by developing specific e-learning-related teaching and learning activities; (iv) To provide a tool that can assist nurse educators, nursing students and other stakeholders to generate context-driven and practice-specific knowledge, to achieve educational and practical goals, and function in a dynamic and knowledge-driven context such as use of technology in education, particularly in nursing education.

The model presents **e-learning** as the core phenomenon in nursing education, conceptualised as **a mechanism to advance political agenda**, as **a student-centred approach**, as **a blended learning approach**, and as **a tool to open access to education for working nurses and midwives**. These conceptualisations are interrelated as they all depict e-learning as an innovative and active process with the potential to produce a change in nursing education. The e-learning in nursing education is presented as the platform within which the teaching and learning environment is situated. E-learning in nursing education comprises all the structures, processes and procedures that serve to guide, regulate and determine e-learning in nursing education in Rwanda. This model presents the context of e-learning which defines the boundaries of e-learning in nursing education, that are both instructional and technological. However, this model is subjected to internal and external factors which may challenge the process and the procedures and have an impact on the outcomes.

There are two major processes involved in this model: Catalyst agents and hybrid teaching and learning. The **catalyst agent process** focuses on institutional support for students and teachers. This institutional support is based on an instructional and technical design which later will lead to hybrid teaching and learning. At this catalyst level, there is also partnership and collaboration, e-learning policies and regulations, an effective learning management system, e-readiness (of students, teachers and the institution), and bridging the digital divide (political commitment, early socialisation in ICT, and emotionally mature students). The **process of hybrid teaching and learning** represents the actual facilitation of teaching and learning,

through two phases: course development, and course delivery. The content development phase consists of activities including analysis, planning, design, development, and evaluation. The content delivery of implementation phase consists of activities including administration, maintenance, marketing, sales of learning products and engagement with instructional teaching and learning. The **outcome** of this is to improve the quality of nursing and midwifery education, to fast-track production of the nursing and midwifery workforce, to increase nursing and midwifery workforce, to enhance nursing care and services, to enhance collaborative partnership, and to promote lifelong learning.

## **6.10 CONCLUSION**

This e-learning model in nursing theory has been designed to illustrate the middle-range theory developed from grounded theory inquiry. E-learning was the core phenomenon of investigation. E-learning was conceptualised as a mechanism to advance a political agenda, as a student-centred approach, as blended learning, and as a tool to open access to education for working nurses and midwives. The context of e-learning in nursing education is subjected to both internal and external influences in which education, health and technology originated. The catalyst agents, and effective hybrid teaching and learning are pivotal to the success of e-learning in nursing education. The importance of hybrid teaching and learning is recognised through course content development and delivery. An effective hybrid teaching and learning ultimately contribute to the quality of nursing and midwifery education, to fast-track production of the nursing and midwifery workforce, to increased nursing and midwifery workforce, to improved quality of nursing care and services; and to promotion of lifelong learning.

The future of e-learning will be enhanced by the collaborative partnership with various stakeholders, taking into consideration the dynamic and evolving nature of the context. Lifelong learning is emphasised as students learn to engage and experience learning in a practical way rather than merely focusing on theoretical knowledge. Integrating the theory acquired from the classrooms into practice at various clinical settings facilitate lifelong learning by acquiring transferable learning experiences.

## CHAPTER 7

### MODEL CRITIQUE

#### 7.1 INTRODUCTION

This chapter presents a critique of the developed model and demonstrates measures used to ensure that quality and rigour during the theory development process were observed. The purpose of rigour in a qualitative study is to ascertain the reliability of data which is based on the consistency and care in the application or research practices, and the reliability of analysis and conclusion presented as an open account that considers preconceptions and limits of findings (Davies and Dodd, 2002). Strauss and Corbin (1990), suggest four criteria to assess the quality and the applicability of the theory to the study's phenomenon: fittingness; understandability; generality; and control. Chiovitti and Piran (2003) suggest eight research practices to ensure rigour in the generation of grounded theory based on the known standards of rigour that are **credibility, auditability and fittingness**. The eight research practices are grouped as follows according to the standard of rigour:

**Credibility:** (i) Let participants guide the inquiry process; (ii) Check the theoretical construction generated against participants' meanings of the phenomenon; (iii) Use participants' actual words in the theory; (iv) Articulate the researcher's personal views and insights about the phenomenon explored by means of post comment interview sheets used as a tool, a personal journal; monitoring how the literature was used (Chiovitti and Piran, 2003).

**Auditability:** (v) Specify the criteria built into the researcher's thinking; (vi) Specify how and why participants in the study were selected (Chiovitti and Piran, 2003).

**Fittingness:** (vii) Delineate the scope of the research in terms of the sample, setting, and the level of the theory generated; (viii) Describe how the literature relates to each category which emerged in the theory (Chiovitti and Piran, 2003).

In this study, these eight research procedures were used to address the issue of quality and rigour in the generation of the e-learning model in nursing education.

## **7.2 QUALITY AND EVALUATION OF E-LEARNING IN NURSING EDUCATION MODEL**

In this study, the criteria of credibility, auditability and fittingness were used to address eight methods of research practice for enhancing standards of rigour as recommended by (Chiovitti and Piran, 2003).

### **7.2.1 Credibility**

According to Guba and Lincoln (1994), credibility is aimed at addressing the authenticity of the data collected and assesses the degree to which the theoretical concepts which emerge are actually grounded in the data. Denzin and Lincoln (1994) suggest prolonged engagement, triangulation of data and member checking as some techniques which can be employed to ensure credibility. The following methods were used to ensure the credibility of the generated model.

**Let the participants guide the inquiry process:** Chiovitti and Piran (2003) state that it is important to ensure that the phenomenon investigated is accurately identified and delineated, and the participants need to guide the inquiry process. In this study, participants directed the inquiry, as they were involved throughout the research process. Following the exploration phase in the first cycle, further questions were generated from an iterative process following the concurrent data collection and analysis processes. The purpose of this study was to analysis the utilisation of e-learning platform, and to develop a middle-range theory. E-learning became the core phenomenon. The codes generated were used to guide further data collection, and action. The primary codes were used and developed to preserve participants' language.

**Check the theoretical construction generated against participants' meanings of the phenomenon:** According to Strauss and Corbin (1998), the theory must be recognisable to the participants and must represent the participants' views and experiences. In this study, emerging concepts were cross-checked against data and participants' meanings were further solicited through member checking and seminal presentations of findings. This was done in two stages: preliminary results were presented at the descriptive level and the emerging model was presented in the theoretical stage. In the latter stage, participants were given the opportunity to shape the model. Feedback from participants on whether the model represented e-learning model in nursing education in their context and on whether it actually made sense, and from

experts in nursing education, was used to refine the model, and to make sure that it explains e-learning in the context of Rwanda.

**Using participants' actual words in the theory:** This practice helps researchers avoid distorting or misrepresenting participants' meaning (Cooney, 2011; Chiovitti and Piran, 2003). The theory must be recognisable to the participants (Strauss and Corbin, 1998) and must represent the participants' views and experiences (Elliott and Lazenbatt, 2005). In this study, the objective was to analyse the utilisation of the e-learning platform and to develop a middle-range theory. Based on the knowledge and understanding of the participants, e-learning in nursing education became a core phenomenon. The use of participants' actual words in the theory was observed by using extracts to support findings in the stages of theory development. Furthermore, in this model concepts and sub-concepts were data extracts, all taken from the participants' own words: self-directed learning; collaborative learning; inquiry-based learning; interactive learning; integration of theory and practice; online learning and face-to-face learning; use of ICT in teaching and learning; time saving; accessibility of resources anytime, anywhere; cost effectiveness; e-learning as tool to open access to education for the working nurses and midwives; political commitment to integrate ICT in nursing; institutional support for teachers and students; stability of the Moodle platform; partnership and collaboration; e-readiness of the institution, the students and the teacher to embrace the technology in nursing education; bridging the digital divide. Participants also confirmed these points in the presentation of the preliminary findings from cycle one, in the training session on the use of Moodle and in the presentation of emerging model.

**Articulate the researcher's personal views and insights:** According to Chiovitti and Piran (2003), explaining the researcher's own constructions of the phenomenon and acknowledging how these affected the inquiry is important for enhancing credibility. In this study, as a researcher, I articulated my personal views and insight regarding the phenomenon of e-learning, using memos and researcher reflective journals to record and examine my personal values, beliefs and assumptions, which were supportive throughout the research process, in order to track the insights and the thoughts.

In this study, limited literature was reviewed before constructing the proposal, in order to provide a rationale for the potential contribution of the study and to show that no identical inquiry had been conducted in the area of e-learning in nursing education. As the purpose of

the study was to analyse the utilisation of e-learning platform in selected nursing schools and to develop a middle-range theory to guide its effective use, a review of the literature on previous constructions of e-learning, and in particularly e-learning in nursing education was conducted. This practice helped to limit the influence of previous theoretical constructions on the middle-range theory developed.

### **7.2.2 Auditability**

Auditability refers to the ability of another researcher to follow the methods and conclusions of the original researcher (Chiovitti and Piran, 2003; Carpenter Rinaldi, 1995). Beck (1993) describes auditability as reflecting the consistency of the research study. Auditability is demonstrated when another researcher is able to follow the audit or decision trail of all the decisions made by a researcher at every stage of data analysis. The procedures below describe research practice for enhancing auditability.

**Specify the criteria built into the researcher's thinking:** In using grounded theory methodology, it is necessary to delineate and specify the criteria used when approaching the transcribed interview data (Chiovitti and Piran, 2003; Strauss and Corbin, 1990). In this study, as recommended by Strauss and Corbin (1990), a consistent format of coding referred to as the paradigm model was used as delineating standard questions consistently asked of the transcribed interview data during analysis. This was also used to guide the researcher's thinking and to establish the relationship among codes. Relationships between different levels of codes were examined in terms of the different features of the theory in the paradigm model. This was representative of the context of e-learning in nursing education, antecedent conditions to e-learning in nursing education; action/interaction of the e-learning, intervening conditions to e-learning in nursing education, and consequences of e-learning. Hence, by delineating the data, researchers can audit their approach during the research process, while leaving an audit trail for another researcher to follow.

**Specify how and why participants in the study were selected:** According to Strauss and Corbin (1990), it is very important to explain how and why study participants were selected in developing a theory using grounded theory methodology. In this study, participants were selected according to their involvement and experiences in e-learning. The participants included: nurse educators, nursing students, ICT managers, campus managers from three campuses of the selected school, and experts in technology and pedagogy.

Based on the use of the mixed methods, stratified sampling was used, followed by simple random sampling in selecting participants to participate in quantitative data collection. In qualitative data collection, purposive sampling was used and the final number of the participants was determined by data saturation. Regarding the inclusion criteria, nurse educators, ICT managers, and campus managers had at least six months' experience working in public or private nursing and midwifery campuses in Rwanda; they were at the time of data collection employed in the selected nursing campuses; they were involved on a daily basis with the nursing and midwifery students; they were willing to participate. Regarding the students, the inclusion criteria were: they had at least one year of using e-learning platform for their learning purposes in selected campuses; they were registered in the selected nursing campuses at the time of data collection, and were willing to participate. For the experts, a purposeful sampling was used to select the participants who would provide rich information throughout the study.

### **7.2.3 Fittingness**

According to Strauss and Corbin (1990), fittingness refers the transferability of the theory and its generalizability to a similar context. Strauss and Corbin (1990) assert that if the theory was carefully induced from diverse data then it should fit that substantive area related to the study phenomenon. Fittingness, also known as transferability, demonstrates whether the findings have meaning and can be used in other similar settings or situations (Beck, 1993). A study achieves fittingness when the findings fit into other contexts and its audience acknowledges meaningfulness and applicability of the findings to their own experiences (Sandelowski, 1986). The procedures below describe research practice for enhancing fittingness as they were observed in the development process of the model.

**Delineate the scope of the research in terms of the sample, setting, and the level of the theory generated:** In this study, the sample was made by e-learning users in selected school campuses: nurse educators, nursing students, ICT managers, campus managers, and experts in technology and pedagogy, since the success of e-learning in nursing education depends enormously on all those participants and the way they experience the phenomenon (Chiovitti and Piran, 2003). Document analysis from various sources was used to ensure that the developed middle-range theory was in line with the current and future trends of education and health in the country.

In this study, the sociodemographic characteristics of the sampled participants are provided. For the students, the sociodemographic characteristics were gender, age, program of enrollment and level of study. The students who participated in this study were from three campuses of the selected nursing school in Rwanda. For nurse educators, ICT managers and campus managers, the sociodemographic characteristics were gender, age, highest level of study, and years of experience. Further to this, providing a thick description of the study setting in terms of utilisation of e-learning at a selected school's three campuses focused met the criteria of fittingness, as essential information was provided regarding the context from which the theory was developed.

The level of theory generated from this study was a middle-range theory, explanatory, and substantive. Moreover, the theoretical models and e-learning in education were delineated. In this study, the researcher made the nature and reason of the theory explicit at the beginning of Chapter 7, where the purpose for the theory developed was described. This information was essential in helping readers to visualise the context from which the theory and its specific categories were developed.

**Describe how the literature relates to each category that emerged in the theory:** In accordance with grounded theory methodology, the literature was searched for findings that referred to a similar phenomenon. In this study, demonstrating the probability that the research findings have meaning to others in similar situations (transferability), literature relating to each category in the middle theory developed was described as recommended by Chiovitti and Piran (2003). By highlighting similarities and differences between the emergent categories and sub-categories of the theory and other empirical evidence, the findings of this study and the theory can be compared to other settings through engaging with literature. Similarities and differences were identified and this demonstrates the possibility of transferability of the findings to other nursing education settings with comparable contexts. Examples are benefits of using e-learning in nursing education, resource constraints, and facilitators' and students' attitudes towards using e-learning in nursing education. The model developed in this study is a substantive theory as it evolved from analysing the utilisation of e-learning in nursing education within the educational context in Rwanda.

### **7.3 CONCLUSION**

The developed middle-range theory has been generated from a participatory effort where nurse educators and technological experts collaboratively engaged in a four-cycle action research project for a period of more than six months. Experts' involvement in the generation of this theory was one of the strengths of this project, as they were not involved in a once-off data collection process but were collectively consulted after open coding to verify categories and after the axial and selective coding to validate the emerging model. This recursive and reflexive methodology not only increased the reliability of the findings but it also involved stakeholders as part of the theory construction process. The study ultimately presents an e-learning nursing education model that has been formulated for the purpose of guiding users, and to be used as a framework to guide improved e-learning in nursing education, improved quality of education in nursing, fast-track production of nursing workforce, improved quality of care and services, promotion of partnership and collaboration, and promotion of lifelong learning, taking the history of Rwanda into account. Extensively explanation has been given in the previous chapters of the decisions made in this inquiry – methodological or ethical or in relation to interpretation and meanings. In this last chapter, quality and rigour of the research process and how conclusion were reached during the process of generating this model have been demonstrated by taking into consideration the criteria of credibility, auditability and fittingness, and eight methods of research practice for enhancing standards of rigour as described by Chiovitti and Piran (2003).

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## APPENDICES

### Annexure 1: Consent form

**STUDY TITLE: An analysis of the utilisation of e-learning platform at a selected nursing school in Rwanda: A participatory action research study.**

Please answer the following questions:

Questions	Yes	No
Have you read and understood the information sheet about this study		
Have you been able to ask questions about this study		
Have you received enough information about this study		
Do you understand that you are free to withdraw from this study?		
At any time?		
Without giving a reason for your withdrawal?		
Your responses will be anonymised before they are analysed		
Do you give permission for members of the research team to have access to your anonymised responses?		
Do you agree to take part in this study		

Your signature will certify that you have voluntarily decided to take part in this research study, have read and understood the information in the sheet for participants. It will also certify that you have had adequate opportunity to discuss the study with an investigator and that all questions have been answered to your satisfaction.

#### Permission for audio-recording: Please tick

- I hereby consent to have this interview / focus group discussion recorded
- I do not consent to have this interview / focus group discussion recorded

**Signature of participant** : \_\_\_\_\_ **Date** :

**Signature of investigator** : \_\_\_\_\_ **Date** :

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## **Annexure 2: Information leaflet**

### **RESEARCH TITLE:**

**An analysis of the utilisation of e-learning platform at a selected nursing school in Rwanda: A participatory action research study**

You are entitled to take part in this research study. This information leaflet is to help you decide if you would like to participate. If you have any questions regarding this study, please do not hesitate to ask the researcher. Your participation is appreciated and important for the improvement of nursing education standards.

### **WHAT IS THE AIM FOR THIS STUDY?**

The aim of this study is two-fold, that is to: (A) Collaboratively analyse the utilisation of the e-learning platform in selected nursing school' campuses at UR, in Rwanda; (B) Develop a middle range theory on the implementation of e-learning in selected nursing school' campuses at UR, in Rwanda

### **WHAT IS EXPECTED OF YOU DURING THIS STUDY?**

You are expected to respond to the questions from the structured questionnaire or the interview guide. The researcher will be available to answer questions you might have regarding the questions.

### **HAS THIS STUDY RECEIVED ETHICAL APPROVAL**

The study protocol was submitted to the research ethical committee at the University of KwaZulu Natal. The faculty will guarantee the written approval. A written permission was granted in order to conduct the research

### **WHAT ARE MY RIGHTS AS A PARTICIPANT IN THIS STUDY?**

Your participation in this study is entirely voluntary and you can refuse to participate.

### **MAY ANY OF THESE STUDY PROCEDURES RESULT IN DISCOMFORT OR INCONVENIENCE?**

Except for the time to complete the structured questionnaire, which is estimated to be 20 minutes, and 45 minutes if you are selected and consent for the in-depth interview. There is no known discomfort or inconvenience related to this study. We appreciate your time. All the information obtained during the course of this study is strictly confidential. Data that may be reported in scientific journals will not include any information that identifies the participants in this study. No identifying information is to be included on the questionnaire to ensure the anonymity.

**Annexure 3: Questionnaire for the Managers of the campuses**

**THE CODE OF THE CAMPUS**

**Section A: Personal background information**

**Q1. Gender**

Female		1
Male		2

**Q2. Age**

**Q3. Qualification**

PhD		1
Master's degree		2
Bachelor's degree		3
Diploma		4
others		5

**Q4. Do you have a qualification in nursing education?**

Yes		1
No		2

**Q5. Professional experience**

Including this school year, how many years have you been?

Campus Manager teacher of this school	
Head teacher of any school (including years in the present school)	
Working in any professional capacity in any school	

**SECTION B: CAMPUS POPULATION**

**Q6. What is the total number of students this school year (2014-2015) in your school, by education level and gender?**

		1	2
		Females	Males
6.1	Number of student at level one		
6.2	Number of student at level two		
6.3	Number of student at level three		

**Q7. How many teachers does your school have this 2014-2015 school year all education levels together?**

**Q8. How many full-time equivalent teachers are teaching at each of the following levels in your school, this school year (2014-15)?**

		Number of teachers
8.1	Teachers at level one	
8.2	Teachers at level two	
8.3	Teachers at level three	

**SECTION C: SUPPORT TO TEACHERS USING ICT**

➤ **Professional development**

**Q9.** In the past two school years (2011-13), what percentage of your teachers has undertaken professional development in the following? *Tick one box for each row*

	None	25 % or fewer	26-50%	More than 50%
Introductory courses on internet use and general applications (basic word-processing, spreadsheets, presentations, databases, etc.)				
Advanced courses on applications (advanced word-processing, complex relational databases, Virtual Learning Environment etc.)				
Advanced courses on internet use (creating websites/home page, video conferencing, etc.)				
Equipment-specific training (interactive whiteboard, laptop, etc.)				
Courses on the pedagogical use of ICT in teaching and learning				
Subject-specific training on learning applications (tutorials, simulations, etc.)				
Course on multimedia (using digital video, audio equipment, etc.)				
Participation in peer learning communities or group work with other teachers about the use of ICT for learning and teaching				
Other professional development opportunities related to ICT				

➤ **ICT Coordinator**

**Q10.** Does your school have an ICT coordinator? *Tick one box only*

	Yes	No
<i>My school has an ICT coordinator</i>		

**Q11.** *If yes: Is this ICT coordinator:* *Tick one box only for each row*

	Yes	No
Available full time?		
Rewarded for such a function concretely (e.g. increase in salary, reduction of workload, prizes, etc.)		
Responsible for providing support in pedagogical ICT use?		

**SECTION D: OBSTACLES TO USE ICT IN TEACHING AND LEARNING**

➤ **Shortage/inadequacy**

**Q12.** Is your school capacity to provide ICT teaching and learning affected by a shortage or inadequacy in the following areas? *Tick one box for each row*

	<i>not at all</i>	<i>a little</i>	<i>somehow</i>	<i>A lot</i>
1. Insufficient number of computers				
2. Insufficient number of Internet- connected computers				
3. Insufficient Internet bandwidth or speed				
4. Insufficient number of interactive whiteboards				
5. Insufficient number of laptops/notebooks				
6. School computers out of date and/or needing repair				
7. Lack of adequate skills of teachers				
8. Insufficient technical support for teachers				

9. Insufficient pedagogical support for teachers				
10. Lack of adequate content/material for teaching				
11. Lack of content in national language				
12. Too difficult to integrate ICT use into the curriculum				
13. Lack of pedagogical models on how to use ICT for learning				
14. School time organisation (fixed lessons time, etc.)				
15. School space organisation (classroom size and furniture, etc.)				
16. Pressure to prepare students for exams and tests				
17. Most parents not in favour of the use of ICT at school				
18. Most teachers not in favour of the use of ICT at school				
19. No or unclear benefit to use ICT for teaching				
20. Using ICT in teaching and learning not being a goal in our school				

**SECTION E: SCHOOL STRATEGY TO USE ICT IN TEACHING AND LEARNING**

➤ **Existing strategies**

**Q13. Does your school have the following? Tick one box for each row**

	Yes	No
1. Its own written statement about the use of ICT		
2. Its own written statement specifically about the use of ICT for pedagogical purposes		
3. A policy and actions to use ICT for teaching and learning in specific subjects		
4. Regular discussions with teaching staff about ICT use for pedagogical purposes		
5. A specific policy or programme to prepare students for responsible internet behaviour		
6. A specific policy about using social networks (Facebook, etc.) in teaching and learning		
7. A specific policy to promoting cooperation and collaboration among teachers		
8. Scheduled time for teachers to meet to share, evaluate or develop instructional materials and approaches		

➤ **Incentives**

**Q14. Does your school reward teachers for using ICT in teaching and learning (whether or not related to ‘good teaching’ awards)?**

	Yes	No
Financial incentives (bonus, increase in salary)		
Reduced number of teaching hours		
Competitions and prizes		
Additional training hours		
Additional ICT equipment for the classroom		
Other (Specify)		

➤ **Innovation policy (not necessarily related to ICT)**

**Q15. Does your school have the following? Tick one box for each row**

	Yes	No
An official policy statement about innovation within the school in teaching and learning methods and/or school organisation more generally		
Initiatives to encourage such innovations within the school (even in absence of policy statement)		
Change management training programme (any time during the last three years)		

**SECTION F: OPINIONS ABOUT ICT USE FOR EDUCATIONAL PURPOSES**

**Q16.** To what extent do you disagree or agree with the following statements about the use of ICT at school? *Tick one box for each row:*

	Strongly disagree	Disagree	Agree	Strongly agree
<b>Computers and the internet should be used for:</b>				
Students to do exercises and practice				
Students to retrieve information				
Students to work in a collaborative way				
Students to learn in an autonomous way				
<b>ICT use in teaching and learning positively impacts on:</b>				
Student motivation				
Student achievement				
Students' higher order thinking skills( <b>critical thinking, analysis, problem-solving</b> )				
Student's competence in transversal skills (learning to learn, social competences, etc)				
<b>ICT use in teaching and learning is essential to prepare students to live and work in the 21st century</b>				
<b>For ICT to be fully exploited for teaching and learning radical changes in nursing campus are needed</b>				

**Q17.** As a campus manager of the school, do you use your computer for any of the following? *Tick one box for each row:*

	Yes	No
School management related tasks (budgeting, planning, timetabling, etc)		
Searching for information		
Making presentations		
Communicating online with teachers (email, website announcements, etc.)		
Communicating online with parents (email, website announcements, etc.)		
Communicating by emails with educational authorities (at local, regional, or central level)		

**SECTION F: SCHOOL AUTONOMY IN PEDAGOGICAL AND ICT DECISIONS**

**Q18.** Regarding your school, who is mainly responsible for the following? *Please tick as many boxes as appropriate in each row*

	Teachers	ICT manager	School educational governing body authority	School head	National education authority	Others (specify)
Procuring ICT infrastructure						
Determining course content						
Choosing teaching methods						
Deciding about teacher training						
Choosing learning resource						

## Annexure 4: Questionnaire for nurse educators questionnaire

Questionnaire Number

Code of the Campus

### SECTION A. SOCIO-DEMOGRAPHIC CHARACTERISTICS

Q1. Gender

Male		1
Female		2

Q2. Age

Q3. Highest Qualification

• PhD		1
• Masters		2
• Honours degree		3
• Bachelors		4
• Diploma		5
• others (specify)		6

Q4. Do you have any qualification in nursing education?

Yes		1
No		2

Q5. How long have you been a lecturer?

Q6. Have you always been a lecturer in this country?

Yes		1
No		2

### SECTION B: INFORMATION ABOUT THE TARGET CLASS YOU TEACH

Number of students

Q7. How many students are in the target class, by gender?

female		
male		

➤ **Subject taught**

Q8. How many subjects do you teach?

➤ **Teaching hours**

Q9. For how many hours a week do you teach the target class?

➤ **ICT in the school curriculum**

Q10. How is ICT taught to the target class?

	Yes	No
ICT is taught as a separate subject		
ICT is integrated into my subject because I choose to do so		
ICT is integrated into my subject because of curriculum requirements		

**Q11. To what extent are the following materials available to the students?**

	1	2	3
	Available at school	Available at another institution	Not available
videos			
Computer lab			
Internet			
Teaching Discs			
Library facilities			
Skills/ simulation laboratories			
Facilities for small group discussion			

**Q12. What teaching strategies are used in your micro curriculum?**

Formal lectures		1
Core lectures		2
Group discussions		3
Small group activities		4
Self-directed learning		5
Situation of integration		6
videos		7
Role play		8
Brainstorming		9
Workbooks		10
Projects		11
Case studies		12
Portfolio		13
Research		14

### SECTION C: EXPERIENCE WITH ICT FOR TEACHING

➤ **Experience in the last 12 months**

**Q13.** Have you used computers and/or the internet for the following activities in the last 12 months? *Tick one box for each row*

Preparing lessons	YES	NO
Class teaching in front of/with the students		

➤ **Length of experience with ICT**

**Q14.** For how many years have you been using computers and/or the internet at any school?

**Q15.** % of time using ICT

More than 75% of all lessons		<b>1</b>
51 to 75% of all lessons		<b>2</b>
25 to 50% of all lessons		<b>3</b>
11 to 24% of all lessons		<b>4</b>
6 to 10% of all lessons		<b>5</b>
1 to 5% of all lessons		<b>6</b>
Less than 1% of all lessons		<b>7</b>
Don't know		<b>8</b>

➤ **ICT access for teaching**

**Q16.** ICT access by teacher and students of the target class

	YES	NO
Students are equipped with computers and/or Internet		
Only the teacher uses a computer and/or Internet		

Both, teacher and students, use computers and/or Internet		
---	--	--

➤ **Access to infrastructure**

**Q17.** Under which conditions do you have access to the following in lessons with the target class?

	No Access	access on demand	on permanent access
Desktop computer without internet access			
Desktop computer with internet access			
Non-internet-connected laptop, tablet PC, netbook or mini-notebook computer			
Internet-connected laptop, tablet PC, netbook or mini-notebook computer			
E-reader (a device to read books and newspapers on screen)			
Mobile phone provided by the school			
Interactive whiteboard			
Digital camera or camcorder			
Computer laboratory			

**Q18.** as the school provided you with a laptop (or tablet PC, netbook, notebook) for your own use this school year?

Yes		<b>1</b>
No		<b>2</b>

**Q19.** Has the school provided students of the target class with a laptop (or tablet PC, netbook, notebook) for their own use this school year

Yes		<b>1</b>
No		<b>2</b>

**Q20.** Are the target class students allowed to use the personally owned devices listed below at school for learning? *Tick one box for each row*

	YES	NO
Laptops, tablet, netbook, notebook		
Mobile or smartphone		

**SECTION D: SUPPORT GIVEN TO TEACHERS FOR ICT USE**

➤ **ICT training compulsory**

**Q21.** Is participation in ICT training compulsory for a teacher in your subject?

Yes		<b>1</b>
No		<b>2</b>

**Q22.** In the past two school years, have you undertaken professional development in the following areas? *Tick one box for each row*

	YES	NO
Introductory courses on internet use and general applications (basic word-processing, spreadsheets, presentations, databases, etc.)		
Advanced courses on applications (advanced word-processing, complex relational databases, Virtual Learning Environment etc.)		
Advanced courses on internet use (creating websites/home page, video conferencing, etc.)		
Equipment-specific training (interactive whiteboard, laptop, etc.)		
Courses on the pedagogical use of ICT in teaching and learning		
Subject-specific training on learning applications (tutorials, simulations, etc.)		
Course on multimedia (using digital video, audio equipment, etc.)		
Participate in online communities (e.g. mailing lists, twitter, blogs) for professional discussions with other teachers		

ICT training provided by school staff		
Personal learning about ICT in your own time		
Other professional development opportunities related to ICT		

**Q23.** In total, how much time have you been involved during the past two school years in the above Professional development opportunities? Tick one box only

No time at all		1
Less than 1 day		2
1-3 days		3
4-6 days		4
More than 6 days		5

➤ **Support from colleagues and/or experts**

**Q24.** What type of support do the following provide you when you use ICT in lessons? Tick one box for each row

	Never used	Rarely used	Mostly technical support	Mostly pedagogical support	Both technical and pedagogical support
A more experienced / knowledgeable teacher					
School ICT/technology coordinator					
Other school staff					
Experts from outside the school					
An online helpdesk, community or website					

➤ **School shared vision about ICT use**

**Q25.** Do you share with your colleagues, the school head and other staff, the same vision about integrating ICT in teaching and learning at your school?

Yes		1
No		2

**SECTION E: ICT-BASED ACTIVITIES AND MATERIAL USED FOR TEACHING**

➤ **Activities**

**Q26.** How often do you do the following activities with the target class? Tick one box for each row

	Never used	Rarely used	Several times a month	At least once a week	Every day / almost every day
Browse/search the internet to collect information to prepare lessons					
Browse or search the internet to collect learning material or resources to be used by students during lessons					
Use applications to prepare presentations for lessons					
Create your own digital learning materials for students					
Prepare exercises and tasks for students					
Post homework for students on the school website					
Use ICT to provide feedback and/or assess students' learning					

Evaluate digital learning resources in the subject you teach					
Communicate online with parents					
Download/upload/browse material from the school's website or virtual learning environment/learning platform					
Look for online professional development opportunities					

➤ **Material**

**Q27.** Which of the following types of materials have you used when teaching the target class with the aid of a computer and/or the Internet? *Tick one box for each row*

	Yes	No
Material that you've searched the Internet for		
Existing online material from established educational sources		
Material that is available on the school's computer network or database		
Electronic offline material (e.g. CD-ROM)		

**SECTION F: OBSTACLES TO USING ICT IN TEACHING AND LEARNING**

**Shortage/inadequacy**

**Q28.** Is your use of ICT in teaching and learning adversely affected by the following? *Tick one box for each row*

	A lot	Partially	A little	Not at all
Insufficient number of computers				
Insufficient number of internet-connected computers				
Insufficient Internet bandwidth or speed				
Insufficient number of interactive whiteboards				
Insufficient number of laptops/notebooks				
School computers out of date and/or needing repair				
Lack of adequate skills of teachers				
Insufficient technical support for teachers				
Insufficient pedagogical support for teachers				
Lack of adequate content/material for teaching				
Lack of content in national language				
Too difficult to integrate ICT use into the curriculum				
Lack of pedagogical models on how to use ICT for learning				
School time organisation (fixed lesson time, etc.)				
School space organisation (classroom size and furniture, etc)				
Pressure to prepare students for exams and tests				
Most teachers not in favour of the use of ICT at school				
Lack of interest of teachers				
No or unclear benefit to use ICT for teaching				
Using ICT in teaching and learning not being a goal in our school				

**SECTION G: LEARNING ACTIVITIES WITH THE TARGET CLASS**

➤ **Types of learning activities**

**Q29.** To what extent do the following aspects of teaching and learning (with or without ICT) feature when teaching the target class? *Tick one box for each row*

	None	A little	Sometimes	A lot
I present, demonstrate and explain to the whole class				
I support and explain things to individual students				
Students work alone at their own pace				
Students work in groups				
Students work on exercises or tasks individually at the same time				

Students give presentations to the whole class				
Students take tests and assessments				
Students are engaged in enquiry-based activities				
Students discuss ideas with other students and the teacher				
Students reflect on their learning				
Students participate in assessing their work				

**SECTION H: TEACHER SKILLS**

➤ **ICT related skills**

**Q30.** To what extent are you confident in the following? *Tick one box for each row.*

	No at all	A little	Somewhat	A lot
Produce a text using a word processing programme				
Use emails to communicate with others				
Capture and edit digital photos, movies or other graphics				
Edit text online containing internet links and images				
Create a database				
Edit a questionnaire online				
Email a file to someone, another student or teacher				
Organise computer files in folders and subfolders				
Use a spreadsheet				
Use a spreadsheet to plot a graph				
Create a presentation with simple animation functions				
Create a presentation with video or audio clips				
Participate in a discussion forum on the internet				
Create and maintain blogs or websites				
Participate in social networks				
Download and install software on a computer				
Download or upload curriculum resources from/to websites or learning platforms for students to use				
Teach students how to behave safely online				
Teach students how to behave ethically online				
Prepare materials to use with an interactive whiteboard				

**SECTION K: TEACHER OPINIONS AND ATTITUDES**

**• Teacher’s opinion about ICT use impact on student learning**

**Q31.** Do you consider ICT use during lessons has a positive impact on the following?

*Tick one box only for each row*

	Not at all	A little	Somewhat	A lot
Students concentrate more on their learning				
Students try harder in what they are learning				
Students feel more autonomous in their learning (they can repeat exercises if needed, explore in more detail topics that they are interested in, etc.)				
Students understand more easily what they learn				
Students remember more easily what they’ve learnt				
ICT facilitates collaborative work between students				
ICT improves the class climate (students more engaged, less disturbing)				

➤ **Attitudes towards ICT**

**Q32.** To what extent do you disagree or agree with each of the following statements about the use of ICT at school? *Tick one box for each row:*

	SD	D	A	SA
<b>ICT should be used for students to</b>				
Do exercises and practice				
Retrieve information				
Work in a collaborative way				
Learn in an autonomous way				
<b>ICT use in teaching and learning positively impacts on students’</b>				
Motivation				
Achievement				
Higher-order thinking skills (critical thinking, Analysis, problem-solving)				
Competence in transversal skills (learning to learn, social competencies, etc.)				
ICT use in teaching and learning is essential to prepare students to live and work in the 21st century				
For ICT to be fully exploited for teaching and learning radical changes in nursing campus are needed				

**Q33.** Answer the following statement based on the teaching style you use

	SD	D	N	A	SA
<b>My teaching style may....</b>					
A: may lead to an inflexibility for managing the concerns of students.					
B: may cause students to feel inadequate when they can't emulate your example.					
C: works well for most students but is very time-consuming.					
D: may leave students feeling anxious about their ability to meet your expectations					
<b>I like to use the following when evaluating student learning.....</b>					
A. teacher made tests					
B: student self-assessment tests					

C: performance based criteria					
D: problem solving and critical thinking					
<b>When planning lessons I prefer to have....</b>					
A. whole class lessons.					
B: role playing.					
C: peer tutoring.					
D: brainstorming.					
<b>When you teach face to face, My instructional time includes...</b>					
A: lectures.					
B: demonstrations.					
C: films/videos.					
D: class discussion/brainstorming					
<b>I believe in teaching by....</b>					
A: being the source of information.					
B: personal example and establishing a prototype.					
C:emphasising student-teacher interactions.					
D: being a resource person as needed by the student.					
<b>One of my goals is to have my student....</b>					
A: function well within the learning structures needed.					
B: observe and emulate what was observed.					
C: able to work independently and under his/her own initiative.					
D: able to work in an autonomous manner.					
<b>One advantage of my teaching style is that it</b>					
A: focuses on clear expectations.					
B: emphasises direct observation.					
C: allows students personal flexibility.					
D: helps students see themselves as independent learners					
<b>Assignments given to students are usually based on:</b>					
A: your personal preferences or on specific instructional models.					
B: a sequence of steps leading to mastery but which you orchestrate.					
C:a student portfolio or learning log which has a self-assessment component.					
D: problem solving based on research of course material.					
<b>My teaching style develops a rhythm which contains</b>					
A: Four steps: content selection					
B: Three steps: selection					
C: Five steps: creating awareness					
D: Twelve steps: ranging from pose and reflect on a problem					

**Thank you for completing this questionnaire**

## Annexure 5: Interview guide for Nurse Educators

Pseudo/Identification Code	
Campus Code	

### Introduction

#### **Recording starts...**

Good morning! Thank you for agreeing to meet with me and share your views.

As you may know, the purpose of this interview is to help us understand the learning and teaching with technology practices and your experiences.

Before we begin, let me review some important considerations. I am recording this interview to ease further analysis for qualitative data but will keep all responses highly confidential.

By accepting to be interviewed / to participate in the focus group discussion, you confirm that you have consented to participate in this study and that the interview/focus group discussion can be audio recorded.

I am just as interested in both negative and positive comments and often the more challenging and in-depth comments are the most helpful.

**Icebreaking: for how long have you been working as a nurse educator?**

**Are you using technology as your teaching tool? ---Elaborate**

### Section 1: Educational Technology

1. What is your understanding of the concept of e-learning platform?
2. Which educational technologies are you using for teaching purposes?

#### **Probing: why?**

3. What are your views about these technologies? (Positive and negative views)
4. Please explain in detail.

**Probing:** Do you have any suggestions or solutions to the situation described?

### Section 2: E-learning Practices

5. Does your school have e-learning policy?
6. How do you implement these policies to your teaching?
7. When facilitating online learning sessions, what is your role and responsibilities, before, during and after?
8. What is your perception on using e-learning system?
9. How do you facilitate e-learning system in your school?
10. What support systems are available that facilitates e-learning system in your school?
11. E-learning is a phrase which is increasingly being used in education. In our context

- How will the role of a lecturer be changed to embed educational technologies into the teaching and learning practices?
- How can e-learning help in developing your students in a holistic manner?

12. Which factors influence your choice of learning methods within an e-learning system?
13. What are the key challenges you are facing in developing/implementing e-learning?
14. What benefits will the nursing school gain from e-learning?
15. What key mistakes would you advise to other nurse educators to look out for and avoid in e-learning program?

### Section 3: Solutions to problems related to e-learning

?

16. Make suggestions to improve understanding of the course content
- Please share any other comments or suggestions you have on the e-learning system

.....  
**Thank for your participation**

## Annexure 6: Research instrument for nursing students

### RESEARCH INSTRUMENT FOR THE STUDENTS

PLEASE INDICATE USING A '√' NEXT TO THE APPROPRIATE ANSWER		
QUESTIONNAIRE NUMBER		
Code of the school		
Q1. What nursing program are you enrolled in for 2014 academic year?		
Nursing		1
Midwifery		2
Q2. Which year of the study are you in?		
1 <sup>st</sup> year		1
2 <sup>nd</sup> year		2
3 <sup>rd</sup> year		3
Q3. What is your age?		
Q4. Gender		
Male		1
Female		2
Q5. How would you rate yourself as a computer user?		
beginner		1
intermediate		2
advanced		3
competent		4
expert		5
Q6. How do you find out about new internet pages/sites? (Please check all that apply.)		
Books		1
Friends		2
Follow hyperlinks from other Web pages		3
Internet search engines (e.g., Alta Vista, Lycos, etc)		4
Internet directories (e.g., Yahoo, McKinley, etc.)		5
Usenet newsgroups		6
Magazines/newspapers		7
Signatures at end of email messages		8
Television advertisements		9
Teachers		10
Other (specify)		11
Q7. How do you rate your ability to use the internet?		
Very good		1
Good		2
Poor		3
Very poor		4
Do not use World Wide Web		5
If poor or very poor please explain why		6
Q8. Which of the following aspects of the internet have you used? (check all that apply)		
email		1
accessing websites		2
Search engines/directories (Altavista, Yahoo, etc.)		3
List serves (email discussion groups)		4
newsgroups/bulletin boards		5
chat rooms		6

internet use for courses (assigned)		7
internet use for courses (on your own)		8
downloading software (programs)		9
playing audio or video over the internet		10
downloading music or video		11
shopping online		12
<b>Q9. Which of the following browsers have you used in accessing the internet?</b>		
Netscape		1
Internet Explorer		2
do not know		3
<b>Q10. Have you used the internet for any of the following? Check any that apply.</b>		
academic-related study		1
communicating with other people		2
pleasure/fun		3
shopping		4
work-related activity		5
getting the latest news or weather		6
listening to music online		7
watching video online		8
finding personal information you want (health, hobbies, etc.)		9
<b>Q11. Are you aware of electronic resources such as e-journals, e-books and databases on internet?</b>		
Yes		1
No		2
<b>Q12. Do you know that many of these online resources are made available in your University?</b>		
Yes		1
No		2
<b>Q13. How do you know about these resources?</b>		
Library orientation		1
Your Lecturers		2
Fellow students		3
The library web page		4
Google Scholar		5
Yahoo		6
Other (specify)		7
<b>Q14. Which search engines do you use? (Please tick all those that apply)</b>		
Alta Vista		1
Ask		2
Being		3
Google		4
Google Scholar		5
Yahoo		6
MSM		7
Info Space		8
Do not have a favourite search engine		9
Other (specify)		10

Q15. Which of the following is your favourite internet search engine?

Alta Vista		1
Ask		2
Being		3
Google		4
Google Scholar		5
Yahoo		6
MSM		7
Info Space		8
Do not have a favourite search engine		9
Other (specify)		10

Q16. Which of the following social networking sites do you use? (*Please tick all those that apply*)

Facebook		1
MySpace		2
Student Village		3
Twitter		4
Others(specify)		5

Q17. How do you rate your ability to use e-mail facilities?

Very good		1
Good		2
Poor		3
Very poor		4
Do not use e-mail		5

Q18. How often do you use internet for the following purposes?

	1	2	3	4
	Always	Very often	Sometimes	Never
Types of internet usage				
WEB-BASED COURSES				
Fully WWW placed courses				
Major component of the course on the www				
Support in www				
www contains only the information on the course				
EDUCATIONAL ADMINISTRATION				
Online admission				
Course registration				
Tuition payment				
Administrative tasks				
DEVELOPMENT AND COMMUNICATION SKILLS				
Thematic student to student correspondence, including students from abroad				
Communication with the lecturer				
Creating hypermedia web pages				

	<b>ELECTRONIC PUBLISHING</b>				
	issuing of online journals				
	Mining information				
	Database browsing				
	Electronic encyclopaedias				
	<b>ASK THE EXPERTS</b>				
	Emailing question to the most famous experts				
	<b>ELECTRONIC APPEARANCES AND VIRTUAL REALISATION</b>				
	Virtual conferences or forums				
	<b>INVOLVEMENT IN RESEARCH PROJECTS</b>				
	Shared global search				
	collection and analysis of information				
	<b>PROFESSIONAL NETWORKING</b>				
	Exchange of experience and information via synchronous and asynchronous teleconferencing and discussion list				

Q19. Overall, how important do you consider the internet in your life?

Not very important		1
Somewhat important		2
Very important		3

Q20. Please rank the following reasons for using the World Wide Web (WWW) in order of importance? Reasons for using World Wide Web  
4= VERY IMPORTANT, 3= IMPORTANT, 2 = SOMEWHAT IMPORTANT. 1= NOT IMPORTANT

	4	3	2	1
Accessing academic-related materials and electronic databases				
Searching the Search engines (such Google, Yahoo, Ask and others)				
Entertainment and sports				
News (worldwide)				
Just browsing with no particular site or subject in mind				
Other				

Q21. In which of the following settings have you *ever* made use of a computer connected to the Internet? (check all that apply)

cybercafé or another setting open to the public		1
library		2
at home		3
at a friend's		4
at school		5
or work home		6

Q22. In which of the following settings do you *most frequently* use a computer to access the Internet?

Cybercafé or another setting open to the public		1
library		2
at home		3
at a friend's		4
at school		5
At work		6

Q23. Where on campus do you access the internet?

Computer laboratories (LANs)		1
Library		2
Residence (wireless hub)		3
classrooms		4

Q24. Do you access the internet from off campus?		
Yes		1
No		2
Q25. How often do you access the Internet?		
Once a month or less		1
Once a week		2
Several times a week		3
Every day		4
Several times a day		5
Q26. How many hours per week do you spend online?		
Less than an Hour		1
1-5 hours		2
6-10 hours		3
11-15 hours		4
16-20 hours		5
21-25 hours		6
26-30 hours		7
More than 30 hours		8
Q27. Which of the following constraints or problems have you encountered when using the internet facilities on campus? (Please tick all those that apply)		
Very few internet computers		1
Very slow internet connection (takes too long load pages)-		2
Very little training in the use of the internet facilities is offered to students		3
No training on how to use internet facilities		4
Restricted access to certain networking sites		5
Q28. What do you find to be the biggest problems in using the Web? (Please check all that apply.)		
Not being able to find the information I am looking for		1
Not being able to efficiently organise the information I gather		2
Not being able to find a page I know is out there		3
Not being able to return to a page I once visited		4
Not being able to determine where I am (i.e., 'lost in hyperspace' problem		5
Not being able to visualise where I have been and where I can go (e.g., view portions of a website)		6
It takes too long to view/download pages		7
It costs too much		8
Encountering links that do not work		9
Encountering pages with bad HTML		10
Getting errors from pages that use Java, Javascript, ActiveX, etc		11
Having problems with my browser (e.g. freezing up, poor interface, getting disconnected, timing out)		12
Sites that are not compatible with all browsers		13
Too many "junk" sites		14
Sites that require me to register with them		15
Sites with too many graphics or useless graphics		16
Advertising banners that take too long to load		17
Encountering sites that want me to pay to access information		18
Other		19

Q29. Is there a need for an orientation for internet utilisation as an academic tool?

Yes		1
No		2

Q30. If yes which of the following do you think orientation should focus on?

Basic IT skills (Microsoft Word, Excel, PowerPoint, Internet, etc)		1
Access academic-related materials such as Journals, software etc		2
Using Moodle		3
Using Turnitin		4
Using Endnote		5
Others (specify)		6

Q31: Rank your perception on the use of e-learning

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
<b>CONTENT</b>					
Q31.1. I am aware of the prerequisites for the course					
Q31.2. I had the prerequisite knowledge and skills for the course					
Q31.3. I was well informed about the course objectives					
Q31.4. The course lived up to my expectations					
Q31.5. The course is relevant to my job					
Q31.6. Reading materials are relevant to the course					
Q31.7. There are strong links between theory and practice					
Q31.8. The content includes knowledge applicable in life					
Q31.9. The content covers current technology use					
<b>DELIVERY</b>					
Q31.10. Is concise and uncluttered					
Q31.11. Uses appropriate style for display					
Q31.12. Features aesthetically pleasing graphics					
Q31.13. Provides descriptions to all links					
Q31.14. Provides materials that stimulate curiosity					
Q31.15. Has a useful function					
Q31.16. Support face to face lecture					
Q31.17. Uses appropriate technology					
Q31.18. Features reasonably fast download of files					
<b>SERVICE</b>					
Q31.19. The instructor was well prepared					
Q31.20. Face to face instruction was helpful					
Q31.21. The online resources are useful					
Q31.22. The online support from peers was helpful					
Q31.23. Sufficient time was given to complete the project					
Q31.24. Comments are responded to within reasonable time					
Suggestions are quickly responded to					
<b>OUTCOME</b>					
Q31.25. The online support from peers was helpful					

Q31.26. The course project is in line with my expectations					
Q31.27. I have gained more knowledge about technology					
Q31.28. I have acquired proficiency in using internet					
Q31.29. I have developed new skill in ICT					
Q31.30. My attitude has changed					
Q31.31. I was able to use the new skill throughout my career					
Q31.32. I have applied the new knowledge in my life					
Q31.33. I initiated new ideas from the new knowledge					
Q31.34. Interactive blogging was essential in the course					
Q31.35. The assessment criteria is fair					
Q31.36. I completed the required tasks for the project					
<b>STRUCTURE</b>					
Q31.37. Free wireless connection is important for learning					
Q31.38. The university provides free wireless connection					
Q31.39. The course content meets my need					
Q31.40. The course uses interactive technology					
Q31.41. The course engages me in the learning experience					
Q31.42. The course builds my confidence in problem-solving					
Q31.43. The course builds my confidence in planning					
Q31.44. The course is interactive					
Q31.45. The instructor act as a partner in learning					
Q31.46. My opinions are considered in the course					
Q31.47. The instructor was empathetic to my needs					
Q31.48. The course creates a positive learning environment					
Q31.49. The course content activities support learning goals					
Q31.50. The instructor facilitates self-directed learning					
Q31.51. The instructor makes his/her expectations clear					
Q31.52. The instructor embeds learning in realistic contexts					
Q31.53. The course allow me to make choices					
Q31.54. The course provides sufficient practice opportunity					
Q31.55. The course provides opportunities for self-reflection					
Q31.56. The course provides opportunities for self-evaluation					
Q31.57. The course supports exploratory learning					
Q31.58. The course enhanced my learning					
Q31.59. The course provides steps/links to further my learning					
Q31.60. The course blog provides access to online resources					

32. Indicate which multimedia can be utilised in e-learning

Simulation / Situation of integration	
Videos	
Role play	
Workbooks	
Projects	
Assignments	
Case studies	
Porto folios	
Evidence-based practice/research articles	

Q33. Students perception on the evaluation done in e-learning system

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
There is a relevance of assignments, quizzes, and test					
There a quality of the questions asked in the quizzes					
there is enough variety in the types of quizzes					
The quiz feedback present new knowledge					
The quiz feedback is timely and relevant?					
The quizzes are presented in adequate intervals					
Quizzes appropriately test the material presented in the course					
I prefer to have seen practice questions for all exams and to have practice questions posted earlier than two to four days before an exam					
The practice questions actually make good learning tools					

Q34. Read each statement carefully. On the line, write tick what best describes how each statement applies to you. Answer honestly. There are no right or wrong answers

	Often	Sometimes	Seldom
<b>Visual Total</b>			
1. I enjoy doodling and even my notes have lots of pictures, arrows, etc. in them.			
2. I remember things better if I write them down, even if I don't go back to see what I've written.			
3. When trying to remember a phone number, it helps me to get a picture in my head.			
4. When recalling information during a test, I can see in my mind's eye the textbook page and the information on it.			
5. Unless I write down the direction to a place, I'm likely to get lost or arrive late.			
6. It helps me to look at a person when he or she is speaking. It helps keep me focused.			
7. It's hard for me to concentrate on what is being said if there is background noise.			

8. It's difficult for me to understand a joke when I hear it.			
9. It's easier for me to get work done in a quiet place.			
<b>Auditory Total</b>			
1. When reading, I read aloud so I can, "hear the words in my head."			
2. When memorising something, it helps me to recite it over and over.			
3. If I want to understand something, it helps me to try to explain it to someone else.			
4. During lectures, I don't need to take notes to remember what was said. Sometimes taking notes even makes it harder for me to listen.			
5. I remember what people have said rather than what they were wearing.			
6. I would rather listen to the news on the radio than read it in the paper.			
7. I like tape recording memos to myself or sending and receiving messages on an answering machine rather than using written notes.			
8. I can easily understand what a speaker is saying, even though my eyes are closed or I'm staring out the window.			
9. I talk to myself when problem-solving or writing.			
10. I prefer to have someone tell me how to do something rather than have to read the directions.			
<b>Kinaesthetic</b>			
1. I don't like to read or listen to directions; I'd rather just start doing.			
2. I learn best when I'm shown how to do something and then have the opportunity to do it.			
3. I can study better with music playing in the background.			
4. Instead of trying to solve problems with a definite plan in mind, I like to try different things until I hit on something that works.			
5. My desk looks disorganised.			
6. I move my lips when I read.			
7. I take notes but seldom go back and read them.			
8. I can easily find my way around, even in strange surroundings.			
9. I think better when I have the freedom to move around. I get fidgety and feel trapped when sitting behind a desk.			
10. When I don't think of a specific word, I'll use my hands a lot and call something a "whatchamacallit" or a "thingamajig."			

## Annexure 7: Interview guide for nursing students

<b>Pseudo/Identification Code</b>	
<b>Campus Code</b>	

### Introduction

#### **Recording starts...**

Good morning! Thank you for agreeing to meet with me and share your views.

As you may know, the purpose of this interview is to help us understand the learning and teaching with technology practices and your experiences.

Before we begin, let me review some important considerations. I am recording this interview to ease further analysis for qualitative data but will keep all responses highly confidential.

By accepting to be interviewed / to participate in the focus group discussion, you confirm that you have consented to participate in this study and that the interview/focus group discussion can be audio recorded.

I am just as interested in both negative and positive comments and often the more challenging and in-depth comments are the most helpful.

**Icebreaking: for how long have you been a student in this institution?**

**Are you using technology as your teaching tool? ---Elaborate**

### **Section 1: Educational Technology**

1. What is your understanding of the concept of e-learning platform?
2. Which educational technologies are you using for learning purposes?  
Probing: why?
3. What are your views about these technologies? (Positive and negative views)
4. Please explain in detail.  
Probing: do you have any suggestions or solutions to the situation described?

### **Section 2: E-learning Practices**

4. Can you share with me your experiences of learning using technology?
5. Does your school have e-learning policy?
6. How do you implement these policies to your learning?
7. When attending online learning sessions, what is your role and responsibilities, before, during and after?
8. What support systems are available that facilitates you when using e-learning system in your school?
9. E-learning is a phrase which is increasingly being used in education.
  - How will the role of the student be changed in order to embed educational technologies into the learning practices?
10. Which factors influence your choice of learning methods within e-learning system solution?
11. Please share with me the advantages/benefits of e-learning to you?
12. What key mistakes would you advise other students to look out for and avoid in e-learning program?
13. Based on your experience, would you take another e-learning course?  
Why or why not?

### **Section 3: solutions to problems related to e-learning**

14. What suggestions would you give to improve e-learning in your nursing campus?  
Please share any other comment or suggestions you have on E-learning system

.....  
**Thank you for your participation**

## Annexure 8: The research instrument for ICT managers

Q1. Please enter the name of your institution:

<b>Name of the school</b>	
---------------------------	--

Q2. Gender

<b>Female</b>	
<b>Male</b>	

Q3. Your age.

Q4. Qualification

Diploma	
Bachelor's degree	
Master's degree	
PhD	
Others (Specify)	

Q5. Do you have a qualification in ICT or computer science?

<b>Yes</b>	
<b>No</b>	
<b>Other (specify)</b>	

Q6. For how many years have you been ICT manager?

**Technology**

Q7. Do you have your own computer in an office at the institution?

<b>Yes</b>	
<b>No</b>	

Q8. If yes, what type of computer do have?

desktop computer	
laptop computer	
both of them	

### SCHOOL ICT INFRASTRUCTURE

➤ EQUIPMENT

Q9. Your school this school year (2014-2015), how many of the devices below are used for educational purposes

A) *If possible state numbers by education level*

		1	2	3
		Level one	Level two	Level three
<b>9A1.</b>	Desktop computer without internet access			
<b>9A2.</b>	Desktop computer with internet access			
<b>9A3.</b>	Non-internet-connected laptop, tablet PC, netbook or mini-notebook			
<b>9A4.</b>	Internet-connected laptop, tablet PC, netbook or mini-notebook			
<b>9A5.</b>	Digital reader (portable device to read books, newspapers, etc. on screen)			
<b>9A6.</b>	Mobile phone provided by the school			
<b>9A7.</b>	Interactive whiteboard			
<b>9A8.</b>	Digital camera			
<b>9A9.</b>	Data projector			

B) *Otherwise, for all levels together - fill in each row only using numbers*

<b>9B1.</b>		Numbers
<b>9B2.</b>	Desktop computer without internet access	
<b>9B3.</b>	Desktop computer with internet access	
<b>9B4.</b>	Non-internet-connected laptop, tablet PC, netbook or mini-notebook	
<b>9B5.</b>	Internet-connected laptop, tablet PC, netbook or mini-notebook	

<b>9B6.</b>	Digital reader (portable device to read books, newspapers, etc. on screen)	
<b>9B7.</b>	Mobile phone provided by the school	
<b>9B8.</b>	Interactive whiteboard	
<b>9B9.</b>	Digital camera	
<b>9B10.</b>	Data projector	

➤ **EQUIPMENT IN USE**

**Q10.** Approximately, what proportion of this equipment (computers, interactive whiteboards, laptops, data projectors) is fully operational this school year? *Tick one box only*

Less than 50%		1
50 to 75%		2
76 to 90%		3
More than 90%		4

➤ **Deployment**

**Q11.** How many desktop computers are installed for educational purposes for pupils to use either alone or with a teacher in the following places? *Fill in each row only using numbers* (where there is no computer for educational purpose, just put '0')

11.1	In computer laboratories	
11.2	In classrooms	
11.3	In the school library	
11.4	In other locations that are accessible to students in the school	

➤ **Connectivity**

**Q12.** Which broadband speed best describes that which your school receives from the telecom provider? *Tick one box only*

144kbps (excl.) – 2mbps (incl.)		1
2mbps (excl.) – 5mbps (incl.)		2
5mbps (excl.) – 10mbps (incl.)		3
10mbps (excl.) – 30mbps (incl.)		4
30mbps (excl.) – 100mbps (incl.)		5
>100mbps		6
None of these; my school is not connected via broadband		7

➤ **Access technology**

**Q13.** By which of the following means does your school mainly have access to the Internet? *Tick one box only*

ADSL		1
Cable		2
Fibre optic		3
Wireless LAN		4
Satellite		5

➤ **Maintenance**

**Q14.** Who maintains the ICT equipment in your school? *Tick one box for each row*

	Yes	No
The school's own staff		
An external company contracted by the school		
An external unit arranged by educational authorities (at local, regional level, etc.)		
ICT manager		
Other		

➤ **Connectedness**

**Q15.** This school year (2014-2015), does your school have any of the following? *Tick one box for each row*

	Yes	No
Its own homepage or website, publicly accessible		
School email addresses for more than 50% of teachers		
School email addresses for more than 50% of students		
LAN (local area network)		
If yes, is this LAN also wireless (wifi)?		
A virtual learning environment (i.e. platform or knowledge management system, etc. possibly hosted externally)		
<i>If yes: Can it be accessed from outside the school</i>		
✓ <i>by the students?</i>		
✓ <i>by the teachers?</i>		
✓ <i>by the public</i>		
✓ <i>outside school hours?</i>		
If your school has none of these items, please tick this box		

**Q16.** What kind of technological equipment is available in the classrooms?

Equipment	In no class-room I use	In some classrooms	In all class-rooms	Upon request
Personal computers				
Interactive whiteboards				
Video conferencing systems				
Audio equipment (including software)				
Digital photo cameras (including editing software)				
Digital video cameras (including editing software)				
Mobile phones				
Projection system				
Other (please specify below)				

**Q17.** Is there technological support available for ICT managers at your institution? Yes/No

Yes	
No	

**Q18.** How would you rate the quality of the technological support?

Poor	
Mediocre	
Good	
Very good	

**Q19.** What best describes your level of technology expertise in home use?

I'm very uncomfortable using technology at home	
I'm fairly uncomfortable using technology at home	
I'm fairly comfortable using technology at home	
I'm very comfortable using technology at home	

**Q20.** What best describes your level of technology expertise in your classroom?

I'm very uncomfortable using technology in my classroom	
I'm fairly uncomfortable using technology in my classroom	
I'm fairly comfortable using technology in my classroom	
I'm very comfortable using technology in my classroom	

**Pedagogical use of ICT**

**Q21.** Does your academic department have a policy to foster and sustain ICT-based innovations in course teaching?

Yes	
No	

**Q22.** Have you ever been engaged personally in a project aimed at using ICT in new and innovative ways as a teacher or teacher trainer?

Yes	
No	

**Q23.** Is there support available for ICT managers regarding the pedagogical use of ICT at your institution?

Yes	
No	

**Q24.** How would you rate the quality of the pedagogical ICT support?

Poor	
Mediocre	
Good	
Very good	

**Q25.** To what extent do you think the use of the technology described below is important **for a nursing educator** to acquire?

	Not important at all	Little important	Quite important	Very important
a) Use of technology for communicating and/or networking....				
with their students				
...with relatives				
...with school management and educational administrations				
b) Use of technology for nurse educators' own development and learning				
c) Use of technology as a management tool...				
...for organising their work and keep records				
...for preparing lessons				
...for finding digital learning resources				
...for designing and producing their own digital learning resources				
d) nurse educators' future integration of technology...				
...to facilitate teaching specific concepts or skills				
...to support various student learning styles and to personalise learning				
...to facilitate teaching pupils with disabilities (cognitive, physical, behavioural)				

...to support activities that facilitate higher-order thinking				
...to support creativity				
...to foster students' ability to use technology in their own learning				
Other (please specify below):				

**Q26.** To what extent do you think the use of technology described below is important **for students** to acquire?

	Not important at all	Little important	Quite important	Very important
a) Use of technology for communicating and/or networking....				
with their students				
...with relatives				
...with school management and educational administrations				
b) Use of technology for nurse educators' own development and learning				
c) Use of technology as a management tool...				
...for organising their work and keep records				
...for preparing lessons				
...for finding digital learning resources				
...for designing and producing their own digital learning resources				
d) nurse educators' future integration of technology...				
...to facilitate teaching specific concepts or skills				
...to support various student learning styles and to personalise learning				
...to facilitate teaching pupils with disabilities (cognitive, physical, behavioural)				
...to support activities that facilitate higher-order thinking				
...to support creativity				
...to foster students' ability to use technology in their own learning				
Other (please specify below):				

**Q27.** Do you teach the use of the technological devices below to **nurse educators**?

Items	Never	Sporadically	In about half of my classes	In every class
Personal computers				
Interactive whiteboards				
Video conferencing systems				

Learning Management Systems/VLE (WebCT, Moodle etc.)				
Audio equipment (including software)				
Digital photo cameras (including editing software)				
Digital video cameras (including editing software)				
Mobile phones				
Projection system				

**Q28.** Do you teach the use of the technological devices below to **students**?

	Never	Sporadically	In about half of my classes	In every class
Personal computers				
Interactive whiteboards				
Video conferencing systems				
Learning Management Systems/VLE (WebCT, Moodle etc.)				
Audio equipment (including software)				
Digital photo cameras (including editing software)				
Digital video cameras (including editing software)				
Mobile phones				
Projection system				

**Q29.** Are the students' pedagogical competencies regarding the use of ICT assessed in your courses?

Yes	
No	
Other	

**Q30.** What importance do you attach to the following suggestions to help ICT managers increase the integration of technology in education?

	No importance at all	Little importance	Quite great importance	Very great importance
Better access to technological equipment				
Reliability of equipment				
Availability of high-quality equipment				
Training/courses in pedagogical use of ICT				
Pedagogical ICT-support (e.g. "hotline")				
Technological hands-on training/courses				
Technological support (e.g. "hotline")				
Policies on using ICT across curriculum				
Time to prepare, explore and develop				
Task-related incentives (salary, promotion etc.)				
Other (please specify)				

Please share any other comment or suggestions you have on e-learning system.

.....  
 .....

## Annexure 9: Interview guide for ICT manager

<b>Pseudo/Identification Code</b>	
<b>Campus Code</b>	

### Introduction

#### **Recording starts...**

Good morning! Thank you for agreeing to meet with me and share your views.

As you may know, the purpose of this interview is to help us understand the learning and teaching with technology practices and your experiences.

Before we begin, let me review some important considerations. I am recording this interview to ease the further analysis for qualitative data but will keep all responses highly confidential.

By accepting to be interviewed / to participate in the focus group discussion, you confirm that you have consented to participate in this study and that the interview/focus group discussion can be audio recorded.

I am just as interested in both negative and positive comments and often the more challenging and in-depth comments are the most helpful.

### **Icebreaking: for how long have you been working as an ICT manager?**

#### **Are you using technology as your teaching tool? ---Elaborate**

### **Section 1: Educational Technology**

1. What is your understanding of the concept of e-learning platform?
2. Which educational technologies are you using for teaching purposes?  
Probing: why?
3. What are your views about these technologies? (Positive and negative views)  
Please explain in detail.

- Probing: do you have any suggestions or solutions to the situation described?

### **Section 2: Educational Experiences**

4. Can you share with us your experience of using e-learning platform?
5. Can you share with me your experiences of using technology?
6. Does your school have e-learning policy?
7. How do you implement these policies to your learning?
8. When facilitating online learning sessions, what is your role and responsibilities, before, during and after?
9. What support systems are available that facilitates you when using e-learning system in your school?
10. E-learning is a phrase which is increasingly being used in education.
11. How will the role of the ICT manager be changed in order to embed educational technologies into the learning practices?
12. Which factors influence your choice of learning methods within e-learning system solution?
13. What challenges do you encounter as an ICT manager?
14. Please share with me the advantages/benefits of e-learning to you?
15. What key mistakes would you advise other ICT managers to look out for and avoid in e-learning program?
16. Based on your experience, would you take another e-learning course?  
Why or why not?

### **Section 3: solutions to problems related to e-learning**

17. What suggestions would you give to improve e-learning in your nursing campus?  
Please share any other comment or suggestions you have on E-learning system

.....

**Thank you for your participation**

**Annexure 10: Content validity of Head of School questionnaire**

Research objectives	Broad research questions	Conceptual framework	Questions
Personal background			Section A: Q1, Q2, Q3, Q4, Q5
To analyse the processes involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR	What is the process involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR?	<ul style="list-style-type: none"> <li>• Content</li> <li>• Delivery</li> <li>• Services</li> </ul>	Section B: Q6, Q7, Q12 Section D: Q12 Section F: Q18
To explore the perceptions of the users of the e-learning platform in selected nursing school' campuses, at UR	What are the perceptions of the users of the e-learning platform in selected nursing school' campuses, at UR?	<ul style="list-style-type: none"> <li>• Learners needs</li> <li>• Learners motivation</li> <li>• Learning environment</li> <li>• Programmes goals</li> <li>• Pedagogical strategies</li> <li>• Learner evaluation</li> <li>• Learner convenience</li> <li>• Content,</li> <li>• Delivery</li> <li>• Services</li> <li>• Outcomes</li> </ul>	<ul style="list-style-type: none"> <li>• Section F: Q16, Q17</li> </ul>
To explore the support provided to the users of the e-learning platform in selected nursing school' campuses, at UR	How are the users supported in the utilisation of e-learning platform in selected nursing school' campuses, at UR?	<ul style="list-style-type: none"> <li>• Content,</li> <li>• Delivery</li> <li>• Services</li> <li>• Outcomes</li> </ul>	Section C Q9, Q10, Q11 Section E: Q13, Q14, 15 Section F: Q20; Q21, Q22

## Annexure 11: Content validity for the question of nurse educators

Research objectives	Broad research questions	Conceptual framework	Questions
Socio-demographic characteristics			Section A: Q1, Q2, Q3, Q4, Q5, Q6
To analyse the processes involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR	What is the process involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR?	<ul style="list-style-type: none"> <li>• Content</li> <li>• Delivery</li> <li>• Services</li> </ul>	Section B: Q7, Q8, Q9, Q10, Q11, Q12 Section E: Q26, Q27 SECTION G: Q29
To explore the perceptions of the users of the e-learning platform in selected nursing school' campuses, at UR	What are the perceptions of the users of the e-learning platform in selected nursing school' campuses, at UR?	<ul style="list-style-type: none"> <li>• Learners needs</li> <li>• Learners motivation</li> <li>• Learning environment</li> <li>• Programmes goals</li> <li>• Pedagogical strategies</li> <li>• Learner evaluation</li> <li>• Learner convenience</li> <li>• Content,</li> <li>• Delivery</li> <li>• Services</li> <li>• Outcomes</li> </ul>	Section C: Q13, Q14, Q15, Q16, 17, 18, Q19, Q20 Section F: Q28 Section H: Q30 Section K: Q31, Q32
To explore the support provided to the users of the e-learning platform in selected nursing school' campuses, at UR	How are the users the supported in the utilisation of e-learning platform in selected nursing school' campuses, at UR?	<ul style="list-style-type: none"> <li>• Content,</li> <li>• Delivery</li> <li>• Services</li> <li>• Outcomes</li> </ul>	Section D: Q21, Q22, Q23, Q24, Q25

## Annexure 12: Content validity for the questionnaire of nursing students

Research objectives	Broad research questions	Conceptual framework	Questions
Socio-demographic characteristics			Q1; Q2; Q3; Q4
To analyse the processes involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR	What is the process involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR?	<ul style="list-style-type: none"> <li>• Content</li> <li>• Delivery</li> <li>• Services</li> </ul>	Q6; Q22; Q23; Q24 Q31-1; Q31-2; Q31-3; Q31-4; Q31-5; Q31-6; Q31-7; Q31-8; Q31-9; Q31-10; Q31-11; Q31-12; Q31-13; Q31-14; Q31-15; Q31-16; Q31-17; Q31-18, Q32; Q33
To explore the perceptions of the users of the e-learning platform in selected nursing school' campuses, at UR	What are the perceptions of the users of the e-learning platform in selected nursing school' campuses, at UR?	<ul style="list-style-type: none"> <li>• Learners needs</li> <li>• Learners motivation</li> <li>• Learning environment</li> <li>• Programmes goals</li> <li>• Pedagogical strategies</li> <li>• Learner evaluation</li> <li>• Learner convenience</li> <li>• Content,</li> <li>• Delivery</li> <li>• Services</li> <li>• Outcomes</li> </ul>	Q5, Q6; Q7 Q8, Q9, Q10, Q11, Q12, Q13 Q14, Q15, Q16, Q17, Q18, Q19, Q20, 21 Q25; Q26, Q27, Q28, Q29, Q30 Q31-26; Q31-27; Q31-28; Q31-29; Q31-30; Q31-31; Q31-32; Q31-33; Q31-34; Q31-35; Q31-36; Q31-37
To explore the support provided to the users of the e-learning platform in selected nursing school' campuses, at UR	How are the users the supported in the utilisation of e-learning platform in selected nursing school' campuses, at UR?	<ul style="list-style-type: none"> <li>• Content,</li> <li>• Delivery</li> <li>• Services</li> <li>• Outcomes</li> </ul>	Q31-19; Q31-20; Q31-21; Q31-22; Q31-23; Q31-24; Q31-25; Q31-38; Q31-39; Q31-40; Q31-41; Q31-42; Q31-43; Q31-44; Q31-45; Q31-46; Q31-47; Q31-48; Q31-49; Q31-50; Q31-51; Q31-52; Q31-53; Q31-54; Q31-55; Q31-56; Q31-57; Q31-58; Q31-59; Q31-60; Q31-61; Q31-62

**Annexure 13: Content validity of the questionnaire for ICT managers**

Research objectives	Broad research questions	Conceptual framework	Questions
Socio-demographic characteristics			Q1, Q2, Q3, Q4, Q5, Q6
To analyse the processes involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR	What is the facilitation process of using e-learning system in selected nursing schools in Rwanda?	<ul style="list-style-type: none"> <li>• Content</li> <li>• Delivery</li> <li>• Services</li> </ul>	Q7; Q8; Q9; Q10; Q11; Q12; Q13; Q14; Q15; Q16 Q25; Q28; Q29
To explore the perceptions of the users of the e-learning platform in selected nursing school' campuses, at UR	What is the experience of nurse educators, students and ICT managers on the facilitation process of e-learning system in selected nursing schools in Rwanda?	<ul style="list-style-type: none"> <li>• Learners needs</li> <li>• Learners motivation</li> <li>• Learning environment</li> <li>• Programmes goals</li> <li>• Pedagogical strategies</li> <li>• Learner evaluation</li> <li>• Learner convenience</li> <li>• Content,</li> <li>• Delivery</li> <li>• Services</li> <li>• Outcomes</li> </ul>	Q19; Q20, Q21; Q22; Q23; Q24; Q25, Q26; Q30
To explore the support provided to the users of the e-learning platform in selected nursing school' campuses, at UR	What are the available support systems that facilitate e-learning system in selected nursing schools in Rwanda?	<ul style="list-style-type: none"> <li>• Content,</li> <li>• Delivery</li> <li>• Services</li> <li>• Outcomes</li> </ul>	Q17; Q18

## Annexure 14: Summary of the strategies to ensure trustworthiness

Strategies	Criteria	Implication
Credibility	Prolonged and varied field experience	I am a nurse educator in one of the selected nursing schools
		Time spent in direct contact
	Reflexivity	Field note was taken
		I was constantly reflecting on how as a research I might influence the data
	Triangulation	Quantitative data was collected and analysed
		Qualitative data was collected and analysed
		Unstructured interviews was used
		Data was analysed by a co-coder ( a research assistant)
	Peer examination	Consensus with the research members was required
		Discussion with supervisor
Authority of researchers	I have completed a master's degree in nursing education at the University of KwaZulu Natal	
	I have an experience in the settings to researched and in the field of nursing education	
	My supervisor has a PhD and is a senior lecturer at the Nursing School of the University of KwaZulu-Natal	
	Research team was nurse educators and ICT managers with various responsibilities in their respective settings	
Dense description	In deep description of the background, duration, research methodology, literature control and validation workshop	
Transferability	Dense description	In deep description of the background, duration, research methodology, literature control and validation workshop
Dependability	Dense description of methodology	As discussed
	Triangulation	As discussed
	Dependability audit	Primary data was kept in a safe place by my supervisor and I for a period of five years
		Dense description of methodology and decision making
		Correct reference techniques
	Specific strategies with data collection	External reviewers, supervisor and consensus discussion with research team members
Discussed in the methodology		
Confirmability	Confirmability of data	Between research team members and me
		Safekeeping of the primary data and field notes for five years
		Thorough description of the research design and method
		Literature review
	Triangulation	As discussed
	Reflexivity	As discussed
	Peer examination	Consensus with the research members was required
Discussion with supervisor		

## **Annexure 15: Application for ethical clearance (HSSREC)**

HARERIMANA Alexis  
University of KwaZulu Natal  
Howard College  
School of Nursing and Public Health  
PhD (Nursing education)  
Tel: (+27)0733571170; (+250)0788877277  
E-mail: haralexis@yahoo.fr  
Date: 28<sup>th</sup> June 2014

**To the Research Office: HSSREC - ETHICS**  
University of KwaZulu Natal  
Durban

Sir / Madam,

### **RE: APPLICATION FOR THE ETHICAL CLEARANCE**

I, HARERIMANA ALEXIS, a student at the University of KwaZulu Natal, currently doing PhD of Nursing (SN: 208530822), have to conduct a research a requirement for my degree and the research. The research study is “**An analysis of the utilisation of e-learning platform at a selected nursing school in Rwanda: A participatory action research study**”

I hereby apply for ethical clearance for my research that would allow me to collect data from a **selected nursing school in Rwanda**. Expected timeframe of 6 months, will be required to collect data from the head of school, campus managers, nurse educators, ICT managers, and nursing students starting from July 2015 to November 2015 All study participants will be requested to complete a questionnaire on the use of the e-learning system in their campuses. The in-depth interview followed by a focus group will be conducted to get a deeper understanding of the phenomenon.

All results and names of participants will be confidential. Findings will be communicated to the UKZN School of Nursing and Public Health, and to the selected nursing campuses where this study will be conducted. There is no potential risk to the participants involved in the study, except that they will benefit by gaining more knowledge on the utilisation of e-learning platform among undergraduate nursing students. Kindly note, that the participation in this study is voluntary. Attached are copies of: Research proposal, a completed form of ethical application, questionnaires and interview guides for study participants, and consent forms to complete enabling participants to be part of the study. The study will begin once the ethical clearance has been granted.

May I kindly request the permission to begin the research study, and data collection, and I wait in anticipation for a favourable response to be allowed to conduct research and data collection. Any correspondence can be done through the contact details provided above.

Yours faithfully

**Mr HARERIMANA ALEXIS**

Signature

**C.I**

**SUPERVISOR: Professor N.G MTSHALI**

Howard College Campus  
School of Nursing and public Health  
5<sup>th</sup> Floor, Desmond Clarence Building  
4041 Durban /South Africa  
+27 31 260 2498

**Annexure 16: Letter requesting a permission to conduct a research study (SONM/UR)**

HARERIMANA Alexis  
University of KwaZulu Natal  
Howard College  
School of Nursing and Public Health  
PhD (Nursing education)  
Tel: (+27)0733571170; (+250)0788877277  
E-mail: haralexis@yahoo.fr  
Date: 6<sup>Th</sup> SEPT 2014

To the Dean of the school of Nursing at University of Rwanda  
Rwanda

Madam

**RE: REQUESTING A PERMISSION TO CONDUCT A RESEARCH STUDY**

I, HARERIMANA ALEXIS, a student at the University of KwaZulu Natal, doing PhD in Nursing Education (SN: 208530822), have to conduct a research a requirement for my degree and the research. The research study is entitled “**An analysis of the utilisation of e-learning platform at a selected nursing school in Rwanda: A participatory action research study**”

I hereby apply for a permission to collect data from the school of nursing and midwifery under your responsibility. Expected timeframe of 6 months; will be required to collect data from the head of school, campus managers, nurse educators, ICT managers, and nursing students starting from July 2015 to November 2015. Data will be collected from Byumba, Kabgayi and Rwamagana Campuses. All study participants will be requested to complete a questionnaire on the use of the e-learning system in their schools. The in-depth interview followed by a focus group will be conducted to get a deeper understanding of the phenomenon.

All results and names of participants will be confidential. Findings will be communicated to the UKZN/ School of Nursing and Public Health, and to the selected nursing schools where this study will be conducted. There is no potential risk to the participants involved in this study, except that they will benefit by gaining more knowledge on the utilisation of e-learning platform among undergraduate nursing students. Kindly note, that the participation in this study is Voluntary. Attached are copies of: Research proposal, a completed form of ethical application, questionnaires and interview guide for study participants, and consent forms to complete enabling participants to be part of the study. The study will begin once the ethical clearance has been granted.

May I kindly request the permission to begin the research study, and data collection and I wait in anticipation for a favourable response to be allowed to conduct research and data collection. Any correspondence can be done through the contact details provided above.

Yours faithfully

**Mr HARERIMANA ALEXIS**

Signature

**C.I**

**SUPERVISOR: Professor N.G MTSHALI**

Howard College Campus

School of Nursing and public Health

5<sup>th</sup> Floor, Desmond Clarence Building

4041 Durban /South Africa

+27 31 260 2498

## Annexure 17: Application for Research Clearance from Ministry of Education

HARERIMANA Alexis  
University of KwaZulu Natal  
Howard College  
School of Nursing and Public Health  
PhD (Nursing education)  
Tel: (+27)0733571170; (+250)0788877277  
E-mail: [haralexis@yahoo.fr](mailto:haralexis@yahoo.fr)  
Date: 30<sup>th</sup> March 2015

To the Minister of Education  
Kigali / Rwanda  
Sir

### **RE: APPLICATION FOR RESEARCH CLEARANCE**

I, HARERIMANA ALEXIS, a student at the University of KwaZulu Natal, currently doing PhD of Nursing (SN: 208530822), have to conduct a research as a requirement for a PhD degree. The research study is entitled: “**An Analysis of the utilisation of e-learning platform at a selected school in Rwanda: A participatory action research**”

I hereby apply for research clearance to conduct a research and collect data from **the University of Rwanda, School of Nursing and Midwifery, in the following campuses: Byumba, Kabgayi and Rwamagana**. The expected timeframe of 6 months, will be required to collect data from the research participants (Campus managers, nurse educators, students and ICT managers) starting from May 2015 to November 2015. All study participants will be requested to complete consent forms and questionnaires on the use of the e-learning platform in their schools. The in-depth interviews followed by focus group discussions will be conducted to get a deeper understanding of the phenomenon.

All results and names of participants will be confidential. There is no potential risk to the participants involved in this study, except that they will benefit by gaining more knowledge on the utilisation of e-learning platform among undergraduate nursing students. Kindly note, that the participation in this study is voluntary.

Findings will be communicated to the Rwandan Ministry of Education, School of Nursing and Midwifery at the University of Rwanda, the selected Nursing School, and its campuses where this study will be conducted, as well as to the School of Nursing and Public Health at the University of KwaZulu Natal. The Results will also be published in accredited journals.

Attached are the copies of: Ethical Clearance from the University of KwaZulu Natal, research proposal, questionnaires and Interview guides for teachers, students, ICT managers, and campus managers; consent forms for study participants to complete enabling them to be part of the study, Curriculum Vitae, a letter from the sponsor, two passport photographs, a copy of ID, signed affiliation confirmation form. The study will begin once the research clearance has been granted from Ministry of Education-Rwanda.

I will be grateful if my application is put under your consideration and I wait in anticipation for a favourable response. Any correspondence can be done through the contact details provided above.

Yours faithfully

**Mr HARERIMANA ALEXIS**

**C.I**

**SUPERVISOR: Professor Fikile MTSHALI**  
Howard College Campus  
School of Nursing and Public Health  
5<sup>th</sup> Floor, Desmond Clarence Building  
4041 Durban /South Africa  
+27 31 260 2498

Signature

**ETHIC DEPARTMENT**  
Chairperson  
Faculty of Health Sciences  
Research Ethics Review Committee  
Westville Campus: UKZN  
DURBAN  
+27312609441

## Annexure 18: Research plan for the study

Cycles	Objectives	Research approach	Research participants	Research setting	Data collection process	Data analysis	Outcomes
Cycle one: Needs analysis through exploration of the current use of e-learning platform	<p>To analyse the processes involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR</p> <p>To explore the perceptions of the users of the e-learning platform in selected nursing school' campuses, at UR</p> <p>To explore the support provided to the users of the e-learning platform in selected nursing school' campuses, at UR</p> <p>To describe the intervening conditions to the utilisation of the e-learning platform</p>	Quantitative and qualitative	Nurse educators, ICT managers, students and 3 head of school from 3 nursing and midwifery schools	3 nursing campuses	Questionnaires In-depth interviews Field notes Focus group discussion	The quantitative and qualitative data analysis	<p>Needs are highlighted in terms of Utilisation of e-learning platform containing:</p> <ul style="list-style-type: none"> <li>• Processes involved in the utilisation of the e-learning platform</li> <li>• Perceptions of the users</li> <li>• Support provided to the users</li> <li>• Intervening conditions</li> </ul>
Cycle two: Designing an intervention plan based on the identified needs	<p>To analyse the processes involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR</p> <p>To explore the support provided to the users of the e-learning platform in selected nursing school' campuses, at UR</p>	Qualitative	Research team, Nurse educators and ICT managers	2 nursing campuses	Literature review Focus group discuss, and Field Notes	The qualitative content analysis	<p>Plan of the intervention is developed containing:</p> <ul style="list-style-type: none"> <li>• Processes involved in the utilisation of the e-learning platform</li> <li>• Support to be provided to the users</li> </ul>
Cycle three: Pilot testing and evaluation of the intervention plan	<p>To analyse the processes involved in the utilisation of the e-learning platform in selected nursing school' campuses, at UR</p> <p>To explore the perceptions of the users of the e-learning</p>	Quantitative and qualitative	Research team and Nurse educators, ICT managers and students	2nursing campuses	Questionnaires Focus group discussion Fields notes	The quantitative and qualitative data analysis	<p>Evaluation of the plan conducted which indicate:</p> <ul style="list-style-type: none"> <li>• Processes involved in the utilisation of the e-learning platform</li> </ul>

Cycles	Objectives	Research approach	Research participants	Research setting	Data collection process	Data analysis	Outcomes
	<p>platform in selected nursing school' campuses, at UR</p> <p>To explore the support provided to the users of the e-learning platform in selected nursing school' campuses, at UR</p> <p>To describe the intervening conditions to the utilisation of the e-learning platform</p>						<ul style="list-style-type: none"> <li>• Perceptions of the users</li> <li>• Support provided to the users</li> <li>• Intervening conditions</li> </ul>
Cycle four: Development of the middle range theory to guide the utilisation of e-learning platform	To develop a middle range model describing the emerging concepts to guide the teaching and learning process in nursing education institutions in Rwanda.	Qualitative	Research team Nurse educators and ICT managers	1 nursing campus	Literature review Focus groups	The qualitative data analysis	<ul style="list-style-type: none"> <li>• A middle range model is developed to guide the teaching and learning process in nursing education institutions</li> </ul>

**Annexure 19: Certificate of research ethics training from FHI 360**



**FHI 360**

certifies that

***HARERIMANA ALEXIS***

has completed the

**RESEARCH ETHICS TRAINING CURRICULUM**

August 11, 2014

## Annexure 20: Research ethical clearance from the University of KwaZulu Natal



10 October 2014

**Mr Alexis Harerimana (208530822)**  
School of Nursing & Public Health  
Howard College Campus

Protocol reference number: HSS/1294/014D

Project title: An analysis of the utilisation of e-learning platform at a selected nursing school in Rwanda: A participatory action research study

Dear Mr Harerimana,

### Full Approval – Expedited Application

In response to your application received on 02 October 2014, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

**PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.**

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....  
Dr Shenuka Singh (Chair)

/ms

Cc Supervisor: Professor NG Mtshali  
Cc Academic Leader Research: Professor M Mars  
Cc School Administrator: Ms Caroline Dhanraj

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Humanities & Social Sciences Research Ethics Committee

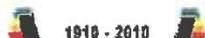
Dr Shenuka Singh (Chair)

Westville Campus, Govan Mbeki Building

Postal Address: Private Bag X54001, Durban 4000

Telephone: +27 (0) 31 260 3587/8350/4557 Facsimile: +27 (0) 31 260 4609 Email: [ximbap@ukzn.ac.za](mailto:ximbap@ukzn.ac.za) / [snymanm@ukzn.ac.za](mailto:snymanm@ukzn.ac.za) / [mohunp@ukzn.ac.za](mailto:mohunp@ukzn.ac.za)

Website: [www.ukzn.ac.za](http://www.ukzn.ac.za)



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**Annexure 21: Recommendation letter from UR-CMS-School of Nursing and Midwifery**



**College of Medicine and Health Sciences**

Dear Mr. Alexis HARERIMANA

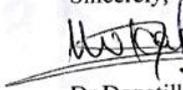
**RE: Permission to conduct a research**

Reference is made to your request for permission to conduct a study in the School of Nursing and Midwifery at the College of Medicine and Health Sciences/University of Rwanda (Byumba, Kabgayi and Rwamagana Campuses), on your research topic which is: "**An analysis of the utilization of e-learning platform in the School of Nursing and Midwifery in Rwanda: A participatory action research study**".

I am pleased to inform you that the permission has been granted to conduct your research on the above mentioned topic. We have found the topic very interesting and we are confident that your contribution to Nursing and Midwifery Education in Rwanda will be of great value and at the end of your program; you will be requested to share your research report.

Thank you very much for choosing the school of nursing and midwifery under the University of Rwanda, and we wish you success.

Sincerely,

  
Dr Donatilla Mukamana

Dean, School of Nursing and Midwifery

College of Medicine and Health Sciences

University of Rwanda

Email: donatillam@hotmail.fr



**Annexure 22: Research Clearance from Ministry of Education**

REPUBLIC OF RWANDA

Kigali, ... 24.10.2015  
N°..... A.B.3.7/12.00/2015



**MINISTRY OF EDUCATION  
P.O.BOX 622 KIGALI**



**Re: Permission to Carry out Research in Rwanda - No: MINEDUC/S&T/306/2015**

The Permission is hereby granted to **Mr. Harerimana Alexis**, Ph.D Candidate, University of KwaZulu Natal, South Africa, to carry out research on: “ **An Analysis of the Utilization of E-Learning Platform at a Selected School in Rwanda: A Participatory Action Research**”.

The research will be carried out at the University of Rwanda, School of Nursing and Midwifery; Byumba, Kabgayi and Rwamagana Campuses. The researcher will need access to the School Curriculum, Academic Policies, Lesson Plan as well as Moodle Platform. He will need to interview Campus Managers, Teachers, Students and ICT Managers.

The period of research is from **24<sup>th</sup> June, 2015 to 23<sup>rd</sup> June, 2016**. It may be renewed if necessary, in which case a new permission will be sought by the researcher.

Please allow the **above mentioned researcher**, any help and support he might require to conduct this research.

Yours sincerely,

MINISTRY OF EDUCATION  
GASINGIRWA Marie-Christine, Ph.D  
Director General of Science,  
Technology and Research

**Marie-Christine GASINGIRWA, Ph.D**  
Director General of Science, Technology and Research  
Ministry of Education

## Annexure 23: Approval to conduct research in Rwanda from Ministry of Education

REPUBLIC OF RWANDA

Kigali, ... 24/06/2015  
N°... 1636.../12.00/2015



MINISTRY OF EDUCATION  
P.O.BOX 622 KIGALI

**Harerimana Alexis**  
Ph.D Candidate  
University of KwaZulu Natal  
South Africa  
E-mail: [harelexis@yahoo.fr](mailto:harelexis@yahoo.fr)  
Tel.: (+27)0733571170/ (+250)0788877277

Dear Mr. Harerimana Alexis,

**RE: Approval to Conduct Research in Rwanda under the Project Title: “An Analysis of the Utilization of E-Learning Platform at a Selected School in Rwanda: A Participatory Action Research”**

I am pleased to attach a copy of research clearance, which has been granted to you to conduct research on the above title.

I wish to remind you that the research clearance number should be cited in your final research report. The research should be carried out under affiliation of the University of Rwanda-College of Medicine and Health Sciences (UR-CMHS), under supervision of Dr. Donatilla Mukamana, Dean of School of Nursing and Midwifery, UR-CMHS.

You are requested to submit the progress report after six months and final report after completion of your research activities to the Ministry of Education of Rwanda.

I wish you success in your research.

Yours Sincerely,  
MINISTRY OF EDUCATION  
GASINGIRWA Marie-Christine, PhD  
Director General of Science,  
Technology and Research



**Marie-Christine GASINGIRWA, Ph.D**  
Director General of Science, Technology and Research  
Ministry of Education

Cc.

- Hon. Minister of Education
- Hon. Minister of State in Charge of TVET
- Hon. Minister of State in Charge of Primary and Secondary Education
- Permanent Secretary, Ministry of Education
- Dr. Donatilla Mukamana, Dean of School of Nursing and Midwifery, UR-CMHS

## Annexure 24: Sample of interview transcript

**R:** Ok...I understand, and basically you told me that you have been teaching for sometimes in e-learning program, so what is your perception of e-learning program?

**TP:** My perception about e-learning is that a kind of teaching students by using also...by emphasizing on online approach, because this e-learning, we didn't have it in the past but now we have it...the concept of introducing in our institution it was for upgrading A2 nurse, upgrading more A2 nurses in a short time, reason is that they saw that it cannot be easily when these students are being taught like full time students. Because these students are working at their working places, they saw that if these students are requested to come for full time program, it could create a different problem, either at the work place they can have a shortage of staff, in health centers and so on...then introducing this approach of e-learning is for facilitating to upgrade more A2 nurses to A1 nurses in a short time...so that...and for them to come for a short time for face to face and more time to be used online at the same time they are doing their job.

**R:** Ok...and now talking about the students studying while they are at their working places at the same time coming to this institution, is there any learning policy in place that dictate what should be done in terms of e-learning program?

**TP:** Yeah about the policy...Ehhh [HESITATING]. I am not quite sure whether it is a policy, or academic rules. What I know about that is that when they were developing a curriculum for e-learning, it is included in that curriculum of e-learning, students will be coming 40% face to face and then go back to their working place for 60% percent, learning online. I know that is what is stated in their curriculum.

**R:** ok...and basically do you think that this academic rule and regulations or the policy as we may call it...is being implemented very well?

**TP:** [laughing louder] ...Yeah...normally it is not being implemented as it should, because of different challenges, this program is facing, at the beginnings of these e-learning programs...it was when these policies were being implemented as it was...as it is respected. But as far as we were progressing, for the implementation as stated in the curriculum, it was not going well as it was expected.

**R:** Oh ok...I can see...you said that when students are not here at school, you interact with them online via Moodle platform when they are in their respective places. What types of activities do you do exactly when you are online and interacting with your students?

**TP:** yeah...for myself...the types of activities in do when I am interacting with them online...the first is to use a forum, where I can request them to discuss and to evaluate how the face to face happened, and request to them if they can ask questions, they can ask them so that I could respond to them. The second one is to provide some assignments, or quizzes online. Forum discussions, asking them to evaluate how face to face happened, and to give their problems so that I could respond to them, and for uploading quizzes and uploading quizzes.

**R:** Oh ok...I can see...and basically is there any support system in your institution that facilitate you, you guys as lecturers for accomplishing your duties?

**TP:** Yeah...the support system we receive it...for example we are having IT who is more trained on how Moodle is used, when we are having some difficulties that IT comes and help us to solve that problem...even regarding to the enrollment of the students...when we are having difficulties to enroll the students we can approach the IT...and for the issue of connection or network...if you are having that issue then the IT man is there for helping us. Also we have seen that because of the over workload...we are having full-time and e-learning students...sometimes as teachers we don't have more time to do online during the day hours, we saw that we become free during night hours...and then we said that if during night hours is when we are free, it is even when we can do that online with the students...we have requested the modems. It was the first time we had requested for these modems, but when it was the time for e-learning they used to provide some airtime to put in these modems so that we could be able to facilitate the students during the night hours.

**R:** Ok ...isn't it really a challenge to interact with the students during the night hours?

**TP:** Yeah...it is very challenging for example, when you are interacting with them during night hours some lack ...because maybe some...they have their wives, they have their husbands, and during the night maybe the husband or the wife they need to do their business...private business, in that case you are not able to follow effectively...even the students at their working places, they complain a lot saying that it is not easy for them, they are having the problem of the network at their work place...and some are not more experts in ICT, and then if it is during the night hours they don't have the opportunity to go together with their colleagues so that they can work together in the groups, you would see that during the night hours everyone is isolated...they are not able to work in the groups...if they are not able to work in groups and I am not expert in ICT, I can even have problem of losing that contact.

**R:** ok ...and now by incorporating ICT...ICT tools or educational technologies in education. How will the role of a lecturer, a nurse educator change?

**TP:** By integrating ICT in teaching, the role of a lecturer is changing, because in the past the lecturer was used only use chalk and black board, writing and writing everything...but nowadays by integrating the ICT the role is changing...because teachers are changing their teaching methods, for example by integrating ICT, I can give assignment to the students, and I request the students, for their presentations to prepare power points, and present to me power points. Doing a presentation with a power point can easily can something rather than only lecturing the course. Some students are still having difficulties in languages, and when you talk and keep talking only, students don't catch well the words, and so on. But if you are talking and projecting the slides, the students can even themselves read and understand. Also...because of technology the teacher can change their teaching methodology, because a teacher can decide. Ahh...it is possible even to use videos... then the teacher can decide to organize the students so that themselves can do self-directed learning without the presence of the teacher...and facilitated by that technology, the student will learn more easily.

**R:** ok...and basically when teaching, you use different teaching methods, so sometimes like you said you have got group discussion, lecturing, chatting...so which factors determine which teaching methods you are going to use today or tomorrow in e-learning program?

**TP:** hum...there are some factors. The first factor is the number of the students we are teaching...if I have more students, I can decide to make more groups...so that by dividing them in more groups, it can facilitate me because they are allocated in their groups...hum...another factor that influence me to state which method I am going to use. It is also the content that I am planning to teach, for example if I see that tomorrow I am going to teach for example fundamentals of nursing and it is the first time of meeting with the students, I can decide to start by lecturing, by talking to the students, and then the next day, it will make demonstrations. If I see that tomorrow it will be doing procedure demonstration...I can sit and decide, because it is demonstration, and the skills lab is not able to accommodate all the students...let me use this approach...then in that case...I can decide to divide the students into small groups and then that these groups will come in skills lab and so on...or even I can say...I will use these videos so that I can demonstrate, because if I am in the classroom, and demonstrate a procedure to more students...students will not be able to follow effectively and easy, and then I decide to divide them into different groups and each group...they are watching the same videos...it can help me for that demonstration

**R:** oh ok...I see... you said you have been teaching in this institution for 4 years...what are the key challenges that you have encountered, faced as a lecturer in this institution especially in teaching in e-learning program?

**TP:** yeah...the challenges, I faced especially in e-learning program, the first challenge is the language barrier...the students...the first intake...was made by very old, very aged students...in 40s, 50s and so on...while they say that...ah... in the past we didn't learn English...so English was a very big barrier...then some said if it possible to include French or Kinyarwanda because when you are talking, we don't understand. Even for us teachers we are not good in English...we were speaking a simple English, and then even with that simple English some students were not able to understand...a part from English barrier, the second one...inadequate skills in terms of using that technology, that Moodle platform...we didn't receive more training on how Moodle platform is being used, even up to now we are still complaining...complaining about getting more and more training...because ICT requires refreshment. And another challenge is more students...you see that it is very difficult to teachers when you are teaching a larger class, it is not like a very small class... another challenge we have faced is that of the over work load because lecturers who teaching e-learning are the same for full time program...and you see that this overwork load, the teachers used to complain that there is no motivation for working two times. The rate of using Moodle was decreasing slowly and slowly because of lack of motivation.

**Annexure 25: Line by line reading of the transcript**

R: Can you share with me some of the challenges you might have encountered in e-learning?

TP: Yes of course. Ahh...one of the challenges is [1] the overload activities, ... we have [2] the shortage of staff, so we are [3] teaching many students also, that is likely to be the big challenge. [3] big classes where you can have [3] more than 80 nursing students in one class. Sometimes [4] we can miss some materials, [5] and the technician, they can be the challenges. But we try to arrange ourselves to overcome these challenges, and provide knowledge to the students.

**Commented [AH(1):**  
**Challenges encountered in teaching**  
 1. Work overload  
 2. Shortage of staff  
 3. Teaching many students/ big classes  
 4. Lack of materials  
 5. Lack of technical support

R: Thank you very much. You said you have been teaching in this institution more than three years, can you tell us how you use educational tools or technological tools during your classroom session?

TP: Yeah... First mostly [1] we use computers while [2] preparing the course guidelines, the [3] power points for presentations, and [4] other different materials that I use for teaching, so we use computers. We use also [5] the internet where sometimes [6] we download some books, [7] read, [8] and get some journals to give to the students...ahhh ...[9] we use also the internet for exchanging information, we [10] have e-learning students you know, when we are teaching them we [10] use this kind of internet while they are working.

**Commented [AH(2):**  
**Types of technology tools**  
 1. Computers  
 3. Power points  
 3. Internets  
 6. Electronic books and articles

**The use of technology tools**  
 2. Preparing course guidelines (Computers)  
 3. Preparing power points presentations (Computers)  
 4. preparing other materials used for teaching (Computers)  
 6. Downloading books  
 7. Reading articles  
 8. Getting articles to give to students  
 9. Exchanging information  
 10. Online teaching and learning

R: Okey...I see., you told me you have used before the educational technologies in education. According to you what are your positive views on these technologies.

TP: wow, there are some the positive, and there are many positive points that are important. Like for instance when you are [1] teaching by using internet. With the internet [2] I can share with the students, where they are far from the school. This is positive and [3] they work, they continue to work and they are learning at the same time, and [4] I am teaching them too. For instance, when I am using internet, and [5] I download these kind of books and journal articles, [6] They are likely to download the updated ones compared to the formal library for instance where you can find the old books, and so on...so we have the update information. ...And also for instance when we are [7] using computers you can keep these records, you [8] can transfer the records easily and so on...

**Commented [AH(3):**  
**Advantages of technology in teaching**  
 1. Online teaching  
 2. Online facilitation of the students  
 3. Flexibility in learning for the working students  
 4. Flexibility of teaching students  
 5. Downloading Journal articles  
 6. Getting updated information  
 7. Keep records  
 8. Easy transfer of the information

## Annexure 26: Sample of the theoretical memos

### **Theoretical memos**

**22<sup>nd</sup> February 2016**

#### **E-learning as a student-centred approach**

**E-learning promotes self-directed learning:** This concept emerged as part of the students centred approach. How can self-directed learning be achieved in e-learning? The participants from this study indicated that e-learning promotes self-directed learning, and accounts for 60 per cent of the time in academic year [TP6, TP18, TP19]. In self-directed learning students learn on their own, information from lecturers or other resources [SP11, SP12]. Students manage their learning activities wherever they are [TP4, TP8], even at work or at home [TP4]. Students take initiatives, are responsible for their learning [TP17], are comfortable with independence, self-discipline, self-confident, and had a high degree of curiosity [SP 15].

Student centred approach in e-learning aims to promote and foster the skills associated with becoming autonomous, self-directed learners [TP12]. Self-directed learning encourages self-management, self-monitoring and motivation [TP1]. One of those tools is the e-learning system where individual learners can become empowered to take increasingly more responsibility for various decisions associated with the learning endeavour [SP9]. Self-directed learning can be supported through open-learning programs, individualized study options, non-traditional course offerings, and other innovative programs [SP5, TP4, TP7].

## Annexure 27: Sample of Field Notes

### FIELD NOTES

FN08

**Campus AC: 14H00**

**Date 18 September 2015**

Today I was collecting my data from one campus AC. I facilitated a focus group discussion that was attended by three people. This venue was ideal as everyone was at that time at the main campus and the dean suggested we conduct it, in her office. It was a well-lit, ventilated office and free of any external noise. I started greeting the participants and thanking them for having made themselves available. I introduced myself and the purpose of the study, and informed them of my progress with individual interviews with the students and the teachers. Before we started the conversation, I requested the group to use the audio recorder. One participant said: *"No there is no need just write the key important information, just write important points, summarize what you think is necessary"*.

I agreed and I said *"No problem I will do that, no recording"*. The focus group discussion started, and I was playing the role of the facilitator. I took a pen and a notebook ready to start writing. I informed them that I am interested in both negative and positive comments and often the more challenging and in depth.

I was told by FDG P1 that nursing students enrolled in e-learning use Moodle, as a learning platform. I sked how Moodle and how it is part of e-learning? FGD-P2 said that Moodle is an online learning management system or a platform used by students and teachers in order to communicate with one another. But this Moodle has been down most of the time in the previous years.

Facilitator: Okey.... how do you as assist in e-learning?

FGD-P2: We have been training some educators and ICT managers from various campuses on how to use Moodle.

Facilitator: Okey... I see...that was great to train nurse educators as a well as ICT mangers, how is the use of Moodle is facilitated from the central level to different campuses

FGD-P2: Moodle started in 2012, but latter on it had quite a lot challenges. It was down most of the time and Moodle hasn't been working for 1 year (2014).

Facilitator: ...That was a great challenge...

FGD-P2: Yeah that is why it (Moodle) had to be relocated from Ministry of Health to USA, at Tulane University from the beginning of this year.

Facilitators: ok...I understand...Are there policies on using Moodle? If yes, what are they?

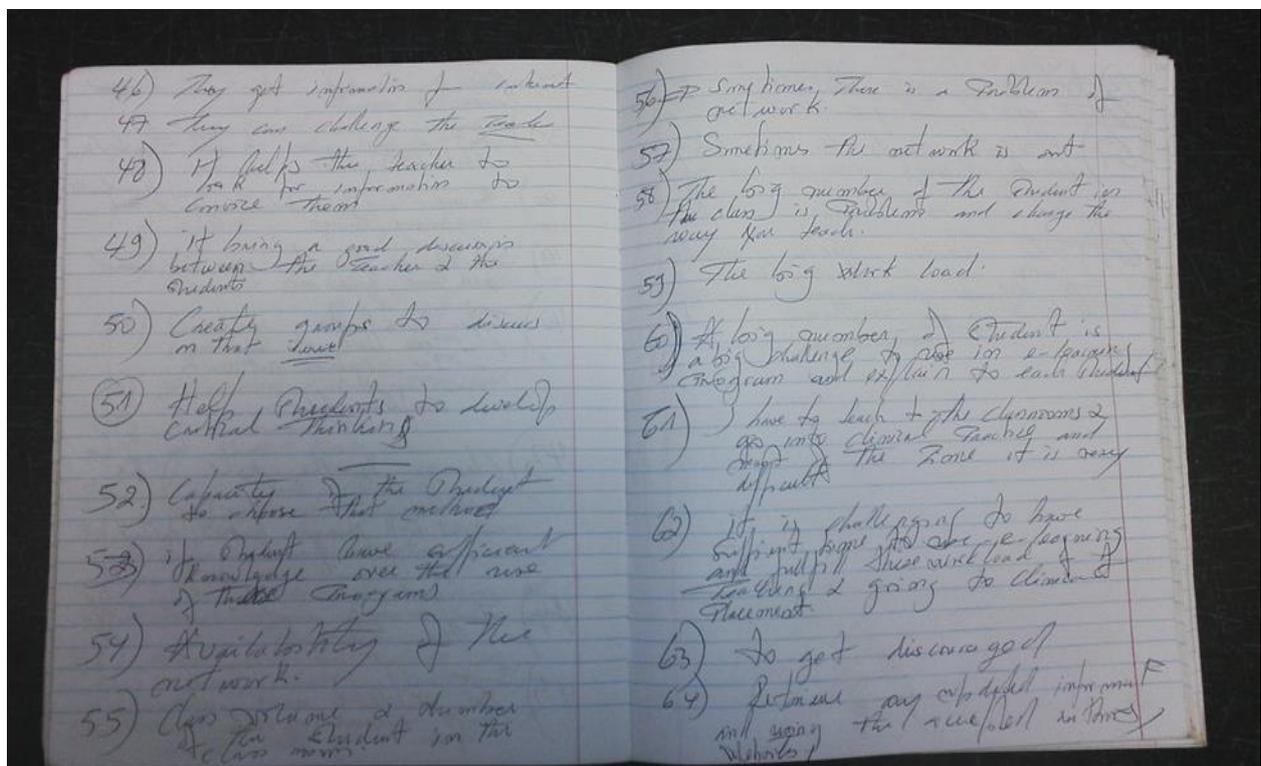
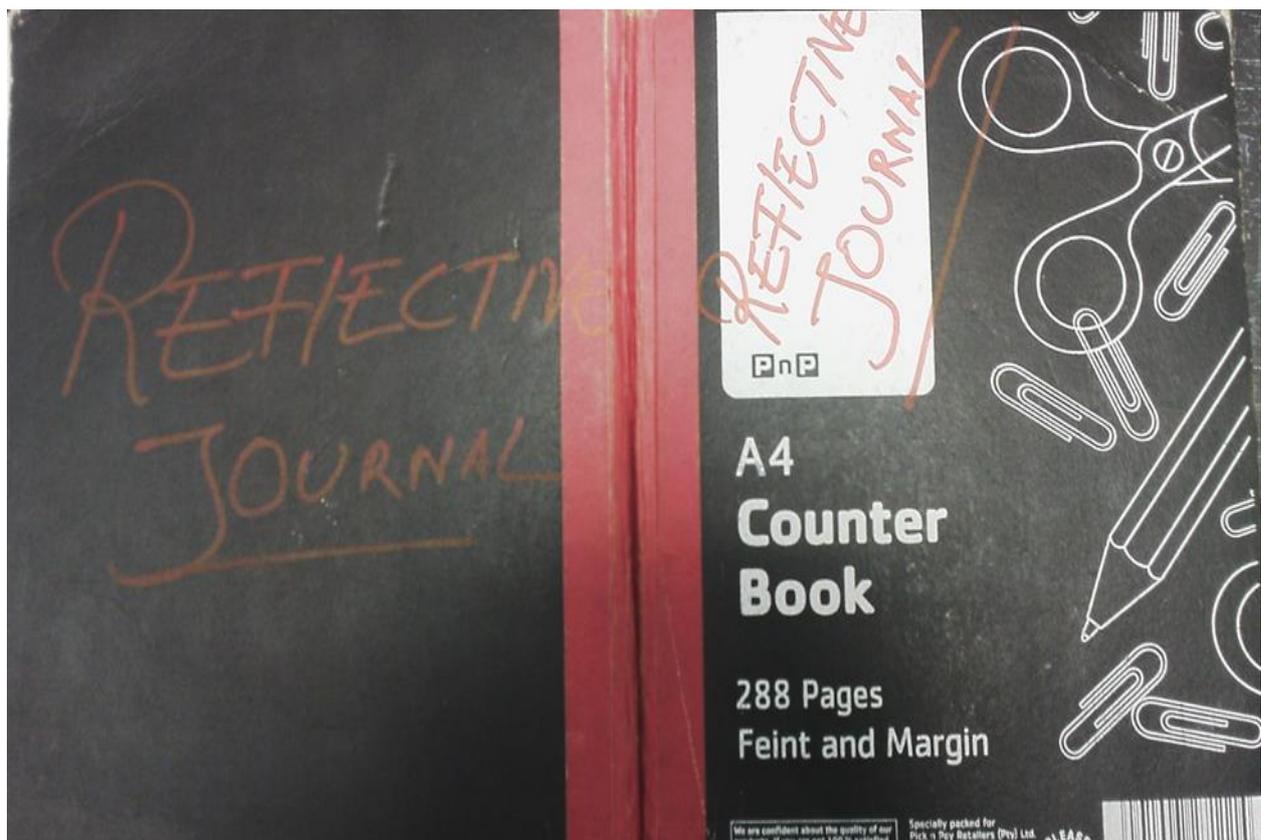
FGD-P2: ah...not much in terms of using e-learning and Moodle

FGD-P1: That is why we have to develop these policies on how it can be used effectively.

Facilitator: ok ...apart from the challenge that Moodle was down for certain time...are there other challenges you have observed from the central level?

FGD-P2 said that there are challenges related to Internet that is slow, or sometimes down, there is computer literacy among students and on how to engage an online discussion, and of course the electricity. FGD-P1 also added that there is lack of training among nurse educators and students on how to use the Moodle platform. That there a need to train lecturers on how to use Moodle.

**Annexure 28: Reflective Journal**



## Annexure 29: Invitation of the participants to the seminar training on Moodle

● Moodle platform



09/23/15 à 1:41 PM

À [redacted], [redacted], [redacted], [redacted], [redacted] et 14 autres...

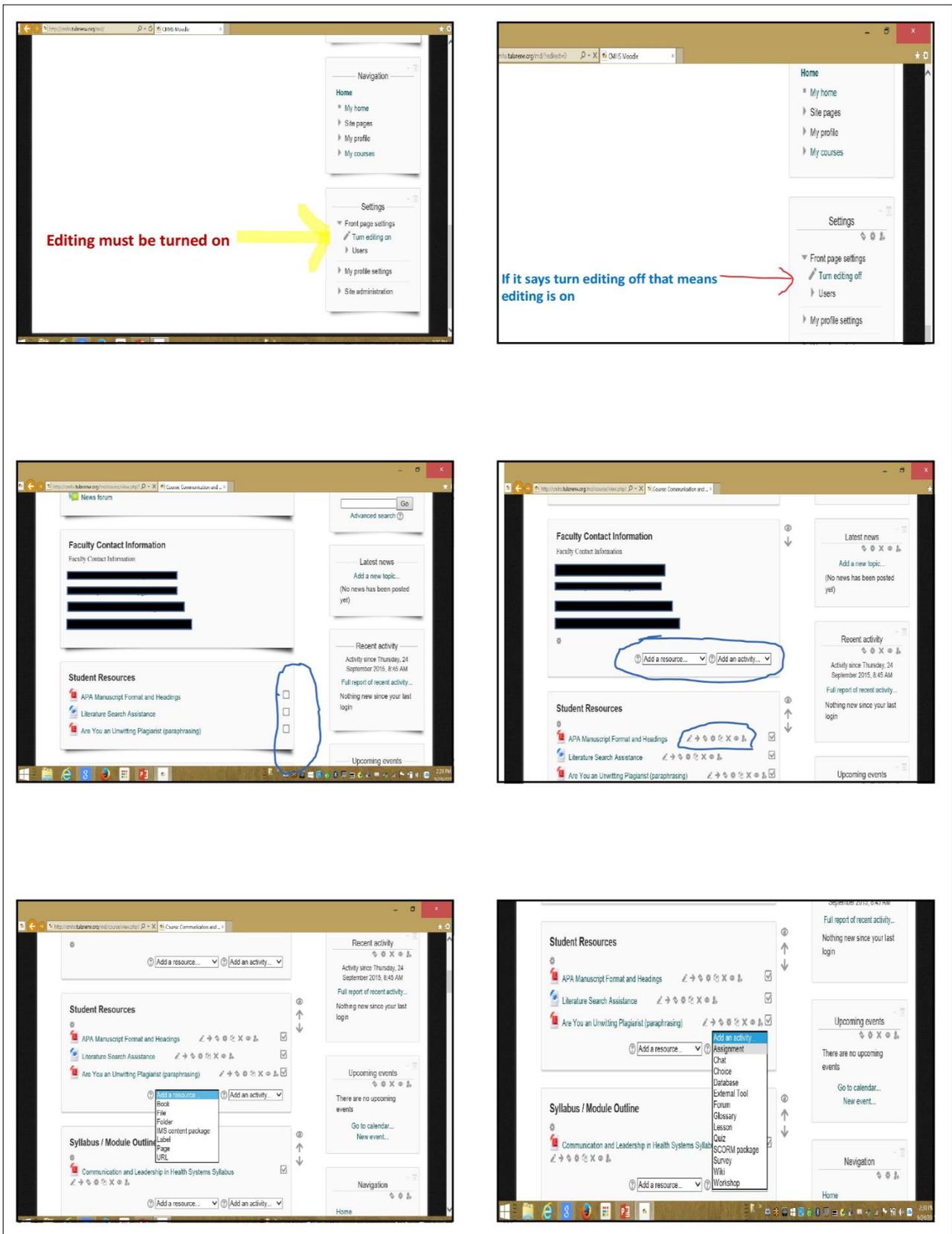
Dear all,

The office of the Dean would like to invite you in the training on the moodle platform taking place on 25th september in the library. The training will be facilitated by Mr.Alex Harerimana and Mrs.Helen.

Thank you.

[redacted]  
Acting Vice Dean  
School of Nursing and Midwifery  
College of Medicine and Health Sciences  
University of Rwanda

# Annexure 30: Sample of the presentation to guide nurse educator to use Moodle



**Annexure 31: Proof of thesis editing-Editor Letter**



16 August 2016

To whom it may concern

This is to certify that I provided editing assistance to Alexis Harerimana in the preparation of his doctoral thesis, "An Analysis of the Utilisation of E-Learning Platform at a Selected Nursing School in Rwanda: A Participatory Action Research Study".

The editing covered English grammar, idiom, orthography, punctuation and sentence structure in the thesis chapters.

I will be happy to furnish additional information if requested.

A handwritten signature in blue ink that reads "David Newmarch".

David Newmarch BA (Hons)(Natal), M Phil (York)





# BJMHR

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## Historical Overview of Nursing and Midwifery Education and Nursing Workforce in Rwanda

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2. *Dean of the School of Nursing and Midwifery/ CMHS-UR*
3. *The Registrar of National Council for Nurses and Midwifery (NCNM) in Rwanda*
4. *Senior Nursing Manager from King Faisal Hospital in Rwanda*
5. *Director, Centre for Teaching & Learning Enhancement (CTLE) at University of Rwanda- College of Medicine & Health Sciences*

### ABSTRACT

Nursing education in Rwanda is undergoing rapid transformation. The literature reveals that the training of nurses and midwives in Rwanda started during the colonial era. Many of the nursing schools were opened by religious institutions such as Catholics, Protestants and Adventists, some being public and private. During 1980s there was a great transformation in nursing education in Rwanda, mainly by phasing out medical assistants, and education was restructured and the secondary program was fixed to 6 years; the nursing program was integrated in secondary education. In 1994, the Genocide against the Tutsi has seriously affected all sectors of life especially nursing. After the 1994 Genocide against the Tutsi, the Government of Rwandan invested in training nurses at various levels, and many public and private nursing and midwifery schools were opened. In 2007, a competency based approach was introduced in nursing education, and Public nursing schools were permitted to train nurses and midwives with advanced diploma (A1). Today, with the support from the Government of Rwanda, Nursing and Midwifery profession is becoming a pillar and cornerstone of Rwandan Health system.

**Keywords:** History of nursing in Africa, Nursing education in Rwanda, transformation of education in Rwanda, Nursing work force in Rwanda.

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## Analysing Nursing Students' Perception on the Utilization of E-Learning Platform in Rwanda: A Descriptive Study

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**Abstract:** Analysis on the perception of e-learning by nursing students was conducted in a selected school' campuses in Rwanda using the Demand-Driven Learning Model (DDLDM)[1]. A quantitative survey was used based on the constructs from DDLM model (Content (PCUE); delivery (PDCE), Service (PSPE), Structure (PSOE), outcomes (POFE), and evaluation (PEDE), data from three campuses of the selected nursing school. Stratified and simple random sampling was used to select the participants. A total of 227 nursing students participated in this study. Overall the results from this study indicate a positive perception of e-learning platform based on DDLM constructs, and a significant correlation was seen between them: the content, delivery, services, outcomes, structure, and evaluation. A Pearson's correlation was run to assess the relationship between various constructs of DDLM in e-learning platform. There were statistically significant relationships between the following constructs related to DDLM: PCUE and PDCE ( $r=.923, n=227, p<.000$ ); PCUE and PSPE ( $r=.911, n=227, p<.000$ ); PCUE and POFE ( $r=.918, n=227, p<.000$ ); PCUE and PSOE ( $r=.912, n=227, p<.000$ ); PCUE and PEDE ( $r=.792, n=227, p<.000$ ); PDCE, and PSPE ( $r=.936, n=227, p<.000$ ); PDCE and POFE ( $r=.915, n=227, p<.000$ ); PDCE and PSOE ( $r=.895, n=227, p<.000$ ); PDCE and PEDE ( $r=.802, n=227, p<.000$ ); PSPE and POFE ( $r=.943, n=227, p<.000$ ); PSPE and PSOE ( $r=.924, n=227, p<.000$ ); PSPE and PEDE ( $r=.836, n=227, p<.000$ ); POFE and PSOE ( $r=.960, n=227, p<.000$ ); POFE and PEDE ( $r=.807, n=227, p<.000$ ), PSOE and PEDE ( $r=.836, n=227, p<.000$ ) (Table 9). The findings add to the growing body of knowledge of online learning. By using this model to evaluate perceptions of quality of e-learning by nursing students has led to insights and recommendations in order to enhance an effectively e-learning platform.

**Keywords:** E-learning platform; Rwanda, Demand Driven Learning Model, e-learning in nursing education; Nursing students.

### I. Introduction

In practice, the successful introduction of e-learning requires not only the construction of software and hardware facilities but also executives' support and commitment, design of proper instructions, introduction of teaching strategies and assessment by professionals[2]. E-learning is commonly referred to the intentional use of networked information and communications technology in teaching and learning [3, 4]. A number of other terms are also used to describe this mode of teaching and learning. They include online learning, virtual learning, distributed learning, network and web based learning. Fundamentally, they all refer to educational processes that utilize information and communications technology (ICT) to mediate asynchronous as well as synchronous learning and teaching activities [4, 5]. On closer scrutiny, however, it was clear that these labels refer to slightly different educational processes and as such they cannot be used synonymously with the term e-learning [4, 5].

In this study the term e-learning is used to refer to the use of ICT in teaching and learning process. The advent of the e-learning and its rapid development from a text-only medium to an expanding multimedia communication system has offered new and diverse opportunities for learning at any time and in any place. The technological revolution is challenging the common conceptions of the teaching-learning process as more and more training is being made available online [6]. Unquestionably, e-learning to become a universally accepted and effective method of learning there must be standards and guidelines for its design, development, delivery, and evaluation. Moreover, these standards and guidelines need to align with specific learner needs and program goals [6]. Effective e-learning must be driven by sound pedagogical principles, be flexible to adjust to the needs and goals of the learners, and provide a community. Clearly, the mere use of the e-learning as an educational tool does not automatically imply effective learning. Indeed, the cornerstone of quality e-learning lies in its design. Designing e-learning involves planning the learning experience so the desired outcomes are achieved and then identifying a blueprint to guide development and overall program implementation. On-going assessment of the e-learning also needs to be considered [6].

## Annexure 34: Published article three

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### **E-Learning in Nursing Education in Rwanda: Benefits and Challenges. An Exploration of Participants' Perceptives**

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**Abstract:** *E-learning is a commonplace in nursing and healthcare professional education, and generally the importance of Information and Communication Technology (ICT) and the Internet in tertiary education is recognized. The entry visa for e-learning is a computer and an Internet connection [1]. The aim of this paper is to analyse the utilisation of e-learning in selected nursing campus in Rwanda. A convergence parallel mixed method was use as recommended by Creswell[2]. For quantitative survey, a total of 275 participants responded to the questionnaires, and for qualitative approach, a total number of 40 participants were purposively selected. Quantitative data was analysed using SPSS 23, and for qualitative data, thematic analysis was used. The finding from this study indicated that participants were ready and eager to embrace e-learning in nursing education due to a number of benefits they reported such e-learning being a student centred approach, being a blended learning method, and fast track for the production of nursing workforce taking into consideration the history of Rwanda. However it was found that a number of challenges were hindering a proper implementation such as: resource constraints, insufficient teachers and students training in ICT, language barrier, lack of policies regarding e-learning, resistance to change, issues related to Moodle accessibility.*

**Keywords:** *blended learning, distance learning, e-learning in nursing, ICT in education in Rwanda, web-based learning.*

#### **I. Introduction**

E-Learning has become a worldwide phenomenon in the new technological economy, crossing oceans and reaching to remote villages. The entry visa for e-learning is a computer and an Internet connection [1]. Integration of ICT competency into a nursing curriculum is important to ensure success throughout the education and career of contemporary nursing students. As enrolment in nursing programs increases, the diverse population of students from many different cultural and socioeconomic backgrounds presents a challenge for faculty in addressing unique learning needs [3]. Since 2000, the growth in e-learning, a blended approach that combines online and face to-face training, has exploded [1]. E-learning is a commonplace in nursing and healthcare professional education[4], and generally the importance of Information and Communication Technology (ICT) and the Internet in tertiary education is recognized [5-7]. As a result, in nursing education both teachers [6], and nursing students [8] are being expected to incorporate and use digital technologies to facilitate learning in undergraduate nursing curricula.

Following the transformation of higher education, and introducing e-learning in nursing schools there is no evidence on how nursing students and nursing educators are using e-learning platform, therefore there was a need for a comprehensive study to explore the utilization of e-learning system platform in Rwandan nursing and midwifery education, and to contribute to its better usage. This study explored the areas knowledge and perceptions of participants on the utilisation of e-learning platform in order to identify the areas that could be improved, in order to enhance student preparation, nurse educators' facilitation of the students via e-learning platform, thus increasing the quality of nursing education, by developing nursing students into autonomous, competent and effective professionals who can provide safe and relevant nursing care. This paper is responding to two research questions that were covered by this study were: (1) how is e-learning platform currently used the selected nursing campuses in Rwanda? (2) What are factors hindering the use of e-learning platform in the selected nursing campuses in Rwanda?

#### **II. Literature Review**

The term e-learning comprises a lot more than online learning, virtual learning, distributed learning, networked or web-based learning. As the letter "e" in e-learning stands for the word "electronic", e-learning would incorporate all educational activities that are carried out by individuals or groups working online or offline,

## Annexure 35: Article manuscript one

### **DIGITALIZATION OF NURSING EDUCATION THROUGH E-LEARNING: A LESSON TO LEARN FROM BRIDGING THE GAP OF DIGITAL DIVIDE IN RWANDA**

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#### **ABSTRACT**

In recent years, Rwanda has made a remarkable progress in the integration of ICT in various sectors, particularly in education. Based on Rwanda Vision 2020, digitalisation is being achieved through a number of initiatives such as putting fibre optic cables around the country, increasing number telecommunication companies offering internet services, e-health, e-education through one laptop per child in elementary school, and recently one laptop per student in tertiary education, just to name few those are strong examples of the digitalisation of Rwanda.

This paper aims at exploring the digitalization of nursing education through e-learning and lessons to learn from bridging the gap of digital divide in Rwanda.

Exploratory qualitative method was used. Three campuses from a selected school in Rwanda participated in this study. The participants included nursing students, and educators, and ICT managers. Purposive sampling was used, and a total number of 40 participants participated in this study (18 nurse educators, 17 nursing students, 2 ICT managers, and 3 members' participants in a focus group discussion. Data was collected using a semi structured interview guide for in-depth interview and for the focus group. Document analysis was also used to get more data. Thematic analysis was used to analyse the data.

The results from this study indicate that in 2012, nursing education was not left behind in the digitalisation of the country, and e-learning was introduced to increase the quality of nursing education, reduce nursing shortage and increase the quantity of nurses in health sector, increase quality care promote the culture of lifelong learning, and enhance transferable skills via the use ICT. However, a number of factors classified under digital divide have emerged from this study to have an impact on e-learning. The following categories and themes emerged from this study. Category one: Digital divide in nursing education through e-learning: (i) Insufficient ICT literacy (computer/internet/ Moodle); (ii) Generational age of nursing students; (iii) Language of instruction barrier; (iv) Poor accessibility to internet/ LMS (due to limited speed, cost and electrical power disruption, limited electrification of the rural areas); Category two: Bridging the gap of digital divide: (i) Political commitment; (ii) Collaboration with Partners; (iii) Early socialization to IT; (iv) Emotionally matured students.

Through the country is classified as a developing country, through partnership with Higher Learning Institutions from developed countries and other stakeholders, the results indicated that there are positive advancements toward filling the gap of digital divide in the area of education in particular e-learning in nursing education, and E-Rwanda is one of these initiatives.

**Key work:** E-learning; Nursing education; Digitalisation; Digital divide; E-Rwanda

#### **1. INTRODUCTION**

E-learning is a broad term that encompasses many teaching approaches, types of technologies and administrative practices (El-Mowafy, Kuhn and Snow, 2013; Olson urt deMaagd, Tarkleson, Sinclair, Yook and Egidio, 2011). Implementing a comprehensive e-learning program would mean changes to the curriculum, infrastructure, teacher professional development, textbooks, and exams (Button, Harrington and Belan, 2014; Olson urt deMaagd et al., 2011). However digital divide between developed countries and developing countries still a major challenge to globalisation of e-learning in developing countries. Although e-learning is popular; a lot of challenges have been noted including: lack of resources, inadequate computer literacy, lack of quality e-content, difficulties to facilitate learners online and language barrier (Najafabadi, Poorsadegh and Mirdamadi, 2013; Mengxue and Yan, 2012; Kader, 2007). The is also lack of relevant ICT standards and lack of a firm framework to encourage students (Zhou and Xie, 2010; Kheswa, 2010; Bouhnik and Marcus, 2006). Lower levels of students and nurse educators to use ICT equipment (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur, 2012; Arthur, Kable and Levett-Jones, 2011).

## **E-learning in Nursing Education: Facilitation Strategies used by Nurse Educators in Rwanda**

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### **Abstracts**

Instructors' abilities to teach online are critical to the quality of online education. E-learning is becoming an increasingly popular method of content delivery in higher education, because of the scheduling flexibility and the ability to meet the needs of a greater number of students. Instructor facilitation has been considered an important indicator of teaching presence, strong enough to encourage students' participation in online discussion. Paper presents facilitation strategies in e-learning used by nurse educators in Rwanda.

A quantitative approach and non-experimental, descriptive design was used to explore the teaching strategies used by nurse educators. A total number of 44 nurse educators participated in this study. A structured questionnaire was used to collect data. The purpose of the study was explained and consent signed. Data analysis was done once all questionnaires were gathered, and SPSS 23 was used.

The findings from this study revealed that the majority of the participants, 84.1% had the same vision about integrating ICT in teaching and learning with their colleagues, the school head and other staff. It was found that 97.7% used computer and or internet in preparing lesson and 97.7% in class teaching in front of/ with the students. As facilitation strategies in e-learning, the majority, 95.5% reported to use self-directed learning, 93.2% reported to use case studies, 88.6% reported to use group discussions, 81.8% reported to use small group activities, 72.7% reported to use formal lectures, 70.5% reported to use role play, 68.2% reported to use brain storming, 63.6% reported to use situation of integration, 63.6% reported to use videos. An average of 50% reported to use research; 43.2% reported to use work books. A small percentage, 27.3% reported to use projects, 25% reported to use core lectures, 11.4% reported to use Portfolio.

Integration of e-learning and ICT is a comprehensive process of applying technology to the educational system to improve teaching and learning. Its success depends not only on the availability of technology, but also heavily on the pedagogical design. Though there is no one formula for determining the optimal level of ICT integration in the educational system, creative teachers at all levels of education have to find ways to incorporate innovative teaching aids and strategies in their classes.

**Key words:** E-learning, teaching and learning; facilitation; teaching strategies; nursing education; ICT in Rwanda

## **1. INTRODUCTION**

Several studies have highlighted the importance of facilitation in an online learning and teaching.<sup>[1-10]</sup> Instructors' abilities to teach online are critical to the quality of online education.<sup>[11]</sup> In a study conducted by Kim and Bonk<sup>[11]</sup>, it was found that the most important skills for an online instructor during the next few years was how to moderate or facilitate learning and how to develop or plan for high-quality online courses. The same authors found that over half of the survey respondents predicted that online collaboration, case based learning, and problem-based learning would be the preferred instructional methods for online instructors in the coming decade.<sup>[11]</sup>

According to King and Arnold<sup>[12]</sup> technology has allowed for higher education institutions to offer e-learning and fully online courses. E-learning is becoming an increasingly popular method of content delivery in higher education, especially at the graduate level because of the scheduling flexibility and the ability to meet the needs of a greater number of students.<sup>[12]</sup> In many online and indeed classroom groups, a small number of participants dominate while others make little or no contribution.<sup>[13]</sup> The use of discussion boards and virtual classrooms do not necessarily lead to collaboration. Most academics have little experience of online teaching and learning and are unsure how to make best use of these online tools. Putting the lecturers in the role of students helps them appreciate the potential of online learning.<sup>[13, 14]</sup>

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## **Information Communication Technology (ICT) Support: Skills Development, and Infrastructures for E-learning in Nursing Education in Rwanda**

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### **Abstract**

Government of Rwanda views Information and Communication Technology (ICT) as a key tool for transforming the economy, with the education sector playing an important role in developing the necessary human resources. Since 2000 there has been a big push to introduce computers into schools and integrate ICT into the education curriculum through a range of initiatives, including e-learning in higher education, ICT training for teachers and One Laptop Per Student that are transforming the delivery and quality of education. Information and Communication Technology (ICT) has the potential to transform teaching and learning processes, thus there is a need for investigating the impact of investments in infrastructure, massive roll-outs of teacher training initiatives, and usage in the classroom. In e-learning, resource support dimension of open, flexible, and distributed learning environment examines the online support and resources required to foster meaningful learning environments.

The aim of this study is to explore the ICT Support provided to nurse educators who teach through e-learning platform in Rwanda, in terms of Skills Development, and Infrastructures.

In this study, a convergence mixed method model also known as concurrent triangulation design was used, where quantitative and qualitative data were collected simultaneous as recommended by Creswell<sup>[1]</sup>, in order to explore the ICT support provided to nurse educators. The findings from this study indicated that nurse educators received ICT support, ranging from compulsory ICT training, pedagogical and technical support. The findings from this study, demonstrated that 63.6% of nurse educators reported that ICT training was compulsory; and 52.3% reported ICT training was provided to the school staff. It was found that 52.3% of nurse educators reported to use internet in more than 75% of all lessons, and 22.7% reported between 71-50%. Data from this study indicated that a number of technology resources were available in the selected campuses. These tools included: ICT laboratories equipped with computers, internet (LAN, and wireless), personal computers, interactive whiteboards, video conferencing systems, and projection system.

For the success of e-learning in nursing schools, ICT support to nurse educators is essential. A focus on infrastructure development and capacity building of nurse educators is pivotal, in order to fully explore the potential ICT can offer in the teaching and learning process.

**Key Words:** ICT, Nursing education, E-learning, ICT infrastructures, technology skills development.

### **1. INTRODUCTION**

E-learning implementation in the teaching and learning process has been presented as an institutional, strategically planned operation.<sup>[1]</sup> The use of Information Communication Technology (ICT) in medical education has increased with the aim of improving the education in this field globally.<sup>[2]</sup> The revolutionary developments in ICT had and have a profound impact on distance education.<sup>[3]</sup> ICT facilities, computer skills, and information skills are the fundamental requirements for learners to engage successfully in e-learning. Information literacy has become essential for nurses, alongside clinical skills<sup>[4]</sup>. Lack of ICT skills was found to have an impact on learning among students in general. Similarly, technical difficulties with online resources and poor software capability were among the issues reported in a qualitative study, which showed that participants claimed that they needed training and hands-on support.<sup>[4, 5]</sup> Traditionally technical support has been seen as the domain of the school (and/or its sub-contractors).<sup>[6]</sup> BECTA<sup>[7]</sup> perceives technical support and service provision as being the remit of teachers, in-house technical support, managed

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