Assessing nursing students' readiness for e-Learning

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SUMMARY

Introduction

e-Learning has been integrated and implemented in education and training to the level that it is now a well-established global practice. If used judiciously, e-Learning is a tool that enables active, individual and flexible learning. When integrated into medical education, it offers features that allow lecturers to be not merely content distributors, but also facilitators of learning.

Aim

The aim of this study was to assess the readiness of students to make the shift from traditional learning, to the technological culture of e-Learning.

Methods

An observational, cross-sectional, analytical study design was used and data was collected using a validated questionnaire. The sample comprised of all students enrolled in the first year nursing programme at the Durban University of Technology registered for anatomy and physiology in 2013. Informed consent was obtained from each participant prior to conducting the study.

Results

Three quarters (77/101 76%) of the participants were females. The psychological readiness score was noted to be high in the "could be worse" category (pre-72%, post-64%). The technological readiness score was noted to be in the "dig deeper" category (pre- 58%, post- 65%) whilst the equipment readiness score fell in the e-Learning "not ready category" (pre- and post- 68%).

Discussion

The Chapnick Readiness Score Guide was used to analyse psychological, technological and equipment readiness. e-Learning has been identified as a multi-disciplinary field,

which is dominated by information technology. Technological and equipment readiness factors of e-Learning are easier to resolve than the psychological readiness factor.

Recommendations

Although e-Learning could be a key tool in nursing education, a few factors require attention before it can be effectively implemented in this tertiary level education facility.**276 words**

DECLARATION

I, Marilynne Coopasami declare that:

i. The research reported in this dissertation, except where otherwise indicated, and is my original research.

ii. The dissertation has not been submitted for any degree or examination at any other university.

iii. This dissertation does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.

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March 30, 2014

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ACRONYMS AND ABBREVIATIONS

B.Tech. Nursing	Bachelor of Technology in Nursing
DUT	Durban University of Technology
e-Learning	Electronic learning
HEQF	Higher Education Qualifications Framework
ICT	Information and Communication Technology
MOOC	Massive Online Open Courses
M. Score	Matric Scores

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1 CHAPTER I: INTRODUCTION

1.1 Background

Electronic Learning (e-Learning) is becoming a common delivery medium for education and training in many organizations. However, educationalists are beginning to question whether e-Learners are adequately prepared to be successful in an online learning environment. The fact that learners demonstrate success in a conventional education and training classroom may not be an adequate predictor of success in an e-Learning classroom. It cannot be assumed that a seamless transition would be made from face-to-face learning environments to e-Learning (Watkins, Dough and Triner 2004).

The introduction of e-Learning in a curriculum is important, as it allows learners to learn in their own time and place. Furthermore, while it allows learners to be self-directed, it also gives them the ability to connect online to download resources that are important for their educational requirements (Ling and Moi 2007). e-Learning holds a number of potential benefits for the learner, including access to learning tools and materials which include audio, video and text, e-mail, online discussions, assessments and blogging. A study conducted by Laurillard (2006) describes the importance of e-Learning in higher education. She explains that e-Learning has a number of benefits including, having access to the Internet for digital versions of resources that are not available locally, and Internet access to explore content and participate in interactive tutorials and collaborative educational games. She also highlights how e-Learning allows students to communicate electronically with their peers and teachers.

At the Durban University of Technology (DUT), e-Learning has grown gradually over the past ten years. Professional development opportunities have been offered to staff through the Pioneers Programme, which aims to assist and equip all staff members with adequate e-Learning skills to enable their transition from traditional classroom teachers to e-Learning facilitators (Peté and Fregona 2004, Peté 2008). The Vice Chancellor has been instrumental in preparing the university's infrastructure in order to have 50% of courses online by the end of 2014, and to this end an e-Learning strategy was developed

in 2012 (Dark 2012). In 2011, the Deputy Vice Chancellor: Academic expressed a vision for the Bachelor of Nursing (B.Tech) programme, to be offered through the medium of e-Learning.

e-Learning is making an important mark in higher education institutions as a delivery medium for education and training. A study conducted by Karamakar and Wahid (2000) on e-Learning readiness in Bangladesh reported that e-Learning provides the ideal environment in which continuous learning can take place. However, e-Learning is not limited to higher institutions; many organisations in the private sector have delivered training using this platform (Watkins, Leigh and Triner 2004). e-Learning is clearly transforming the way the world handles its day-to-day communication.

Research has shown that it is essential to conduct a readiness assessment before the implementation of e-Learning (Djamaris, Priyanto and Jie 2012). Such an assessment evaluates whether the optimum tools needed to implement e-Learning are in place (Psycharis 2005, Borotis and Poulymenakou 2004, Chapnick 2000). An e-Learning readiness assessment reveals the impact of Information and Communication Technology (ICT) on an environment, country or higher education facility, directs development within an institution and identifies areas that need to be worked on before implementation of the e-Learning programme. Several e-Learning readiness assessment methods have been documented in the literature (Chapnick 2000, Borotis and Poulymenakou 2004, and Psycharis 2005). This study focused on the readiness of students to make the shift from traditional teaching and learning methods to a more technological culture of learning.

There are a number of difficulties that an institution of higher education may face during the implementation of e-Learning. A study conducted in Vienna investigated the problems that may be encountered during the execution of a university-wide Learning Management System owing to students' absence of computer literacy or negative acceptance of e-Learning (Link and Marz 2006). They concluded that in order for learners to avoid frustration they must have the suitable level of computer knowledge. This study highlights some of the technological readiness frustrations experienced by students.

1.2 What is known so far?

As noted earlier, e-Learning is gaining popularity worldwide. Many colleges and universities are moving towards a more technological mode of delivering education and training. Advances in networking technologies, multimedia, and the Internet can have a substantial impact on teaching and learning in higher education. DUT is in an intermediate phase of establishing an integrated e-Learning platform for learning, teaching and assessment.

1.2.1 What needs to be known?

Are first year DUT Nursing students ready to take advantage of the opportunities provided by 21st century e-Learning technologies?

1.2.2 What is the importance of this study?

An evaluation of e-Learning readiness is critical for its successful implementation. Success in e-Learning can be achieved by understanding the needs as well as the readiness of students in a particular e-Learning environment.

1.2.3 How will the study solve the problem?

This study focused on students' readiness and their perceptions of the implementation of e-Learning at DUT. It aimed to assist lecturers to prepare students for the shift to e-Learning in the classroom and for students to adopt these e-Learning tools.

1.2.4 Research question

What is the level of e-Learning readiness amongst first year students in the B.Tech Nursing programme at DUT?

1.2.5   Aim of the research

The aim of this study is to determine how ready first year undergraduate nursing students at DUT are to use new technology in the classroom and to integrate e-Learning in their learning; and to establish the factors that influenced their readiness in 2013.

1.2.6   Specific objectives of the research

The specific objectives of this study are:

To assess e-Learning readiness amongst undergraduate nursing students, including their psychological, technological, and equipment readiness.

1.2.7   Operational definitions used in the study

Zhang and Nunamaker (2003) define "**e-Learning** or electronic learning as learning that takes place anytime someone uses electronic means for gathering information that is acquired without another live person present". e-Learning is "all forms of electronic supported learning and teaching which are procedural in character and aim to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner. Information and communication systems, whether networked or not, serve as specific media, to implement the learning process" (Tavangarian, Leypold, Nolting, *et al.* 2004). However, for the purpose of this study the term e-Learning is used to refer to a combination of online (on the Internet) and face-to-face learning. The term used for this combination is "blended learning" (Driscoll 2002, Graham 2006, Rovai and Jordan 2004).

e-Learning readiness: Borotis and Poulymenakou (2004) define e-Learning readiness as "the mental or physical preparedness of an organization for some e-Learning experience or action."

1.2.8   Organisation of the report

The dissertation is divided into six chapters**:**

In chapter 1 the background to the topic and outlines the purpose of the research and the specific objectives is described briefly.

The literature review in Chapter 2 provides an analysis of the existing literature on e-Learning, e-Learning readiness and models of e-Learning readiness.

Chapter 3 covers Materials and Methods and discusses the study design, study population, data sources, sampling methods, variables and statistical analysis applied in this study. The reliability and validity of the study, the handling of bias and the study's limitations are also described.

Chapter 4 focuses on the results of the research study.

Chapter 5 presents a discussion of the findings.

Chapter 6 provides a conclusion and recommendations based on the results of the study.

1.2.9 Summary

In this chapter, I have provided some background information to the study and highlighted the purpose and objectives of the research.

2 CHAPTER II: LITERATURE REVIEW

2.1.1 Introduction

In this chapter I will review the existing literature on the benefits of e-Learning and e-Learning readiness, in order to validate and justify the need for the current study on e-Learning readiness amongst first year nursing students at the University of Technology.

2.2 Purpose of the literature review

The purpose of the literature review is to make a case for e-Learning readiness amongst students in the context of the growing use of e-Learning in higher or tertiary education worldwide and at DUT.

2.3 Literature reviewed

2.3.1 Introduction

The growth and improvement of information technology and the Internet over the past ten years has brought new educational delivery processes like e-Learning to the forefront (Haverila 2011). e-Learning is becoming an important mode of delivery in higher education institutions. The need for a well-educated and appropriately trained workforce has motivated many higher education institutions to restructure their education systems. An education system needs to keep abreast of technological developments in order to implement the necessary policy initiatives and action that will enable it to be a world leader (Kaur and Zoraini 2004, Patterson 2008).

The e-Learning idea has been around for decades and is considered to be one of the most important developments in the information systems world (Wang 2003). It has grown from an idea to something which is now considered mainstream. e-Learning is continuously growing and changing; it dominates the World Wide Web as a whole. Its change has been so "dynamic that we can refer to it by a new name, e-Learning 2.0" (Downes 2005).

e-Learning is becoming a universal delivery medium for education and training in many institutions. It offers a variety of learning styles that have been widely recognised in many countries and institutions. e-Learning has also become an important and valid learning method for health care professionals in the 21st century (Yu, Chen, Yang, *et al.* 2006).

2.3.2   e-Learning benefits

Loidl (2009) established that the use of e-Learning offers the following benefits:

- An increase in flexibility: learners and educators are able to access their courses anytime and anywhere.
- Just-in-time training: information can be delivered immediately it is required.
- Customization: e-Learning information can be specifically designed to suit a student's requirements and the learning model can be more accurately crafted to fit with the individual's situation and requests.
- Diversified learning styles: a number of learning styles can be accommodated and learning can be further encouraged through an assortment of activities applied to the different styles.
- Enhanced communication: educators are able to relate knowledge and information in a more engaging way (text, diagrams and images, video, sound, simulations) as compared to conventional teaching approaches.
- Building communities: e-Learning helps instill confidence in learners, allowing them to engage and interact with their communities in order to promote community development.
- Increased interaction: e-Learning allows for interaction between learners and educators; this facilitates understanding and the capacity to recall such information.
- Improved treatment of information: learners become capable of selecting learning materials or they are otherwise directed to the particular content that will accord with their own level of knowledge, information, interests, etc. e-Learning also encourages the development of curiosity among learners by allowing them to

conduct research to find the information that is most appropriate to their own circumstances.

- Greater degrees of freedom for educators: e-Learning allows educators the freedom to collect and gather important information to build into their course content for all learners to access. Educators are able to focus their attention on the higher aspects of their profession and their own learning rather than on mundane activities.
- Encourages self-organization and responsibility: e-Learning encourages self-paced learning so that the student is empowered and able to learn at the rate they prefer. It promotes self-directed learning by allowing the students to become responsible for their own learning and information gathering, thereby building positive attributes such as self-confidence and self-knowledge.
- Development of soft skills: the development of knowledge and skills such as time management and team work that will help learners throughout their entire professional careers.

2.3.3   e-Learning worldwide

As described in Chapter 1, e-Learning has been defined as all forms of electronic supported learning and teaching which are procedural in character and aim to ensure the building of knowledge with reference to the individual experience, practice and knowledge of the learner. "Information and communication systems, whether networked or not, serve as specific media, to implement the learning process" (Tavangarian, Leypold, Nolting, *et al.* 2004).

e-Learning is described as a suitable response to the call for a just-in-time, easily available, ever-present approach to making available learning more affordable (Borotis and Poulymenakou 2004).

The learners of today are classified as "digital natives", who have the ability to recognise the language of the digital world of computers, video games and the Internet (Prensky 2001). Prensky referred to older staff and lecturers as "digital immigrants" (*ibid.*).

Today's college graduates would have spent an average of less than 5000 hours reading as compared with 10 000 hours playing video games and 20 000 hours watching television. The digital world plays an extremely important role in their lives, and this has gained the attention of many e-Learning specialists (Prensky 2001, Downes 2005).

Therefore e-Learning has been recognized as an important tool that has materialized from information technology, and has started to be integrated into many university programmes (Selim 2007). e-Learning has been classified as one of the new trends that challenges the conventional "bucket theory" or the banking concept of education (Freire 2000). The banking concept refers to a situation where the instructor is the bearer of knowledge who transfers this knowledge to the passive students that attend his/her class.

2.4   e-Learning in nursing education

A study conducted by Yu, Chen, Yang, *et al.* (2006) concluded that the majority of nurses have a positive attitude towards e-Learning. The demands of the nursing profession and the organizations that employ them are advancing continuously. Furthermore, with the modern training and learning needs of organizations threatening to exceed their allocated budgets , e-Learning can provide a particularly suitable means of offering reasonable and practicable solutions to assist nurses in their pursuit of skills, without affecting their working conditions. This study also highlights that e-Learning could help to fulfil public health nurses' personal learning needs and the demands of their job simultaneously. e-Learning could prove to be a valuable aid for many nurses striving to upgrade their skills. It will help graduate nurses to pursue postgraduate studies. In this feasibility study it was concluded that e-Learning programmes allow for a more flexible mode of delivery for public health nurses to continue with their education (*ibid.*).

A study conducted by McVeigh (2009) observes that learning has extended beyond the walls of the classroom. She maintains that e-Learning is the future of nursing education and the facilitation of lifelong, continuous learning. e-Learning can enable student nurses to attain an effective balance between work and their personal life. Studying at a self-

directed pace is a strong motivation for implementing an e-Learning environment (*ibid.*). e-Learning allows for flexibility in terms of time and is a valuable tool for student nurses.

A similar study conducted at a Thailand university among baccalaureate nursing students found that, e-Learning is highly valued by undergraduate nursing students (Sanluang, Sngounsiritham, Poungsombat, *et al.* 2008). The authors believe that e-Learning is an essential tool for undergraduate student nurses as it promotes self-study and is student-centred. This university in Thailand adopted e-Learning as a tool for one of their first year courses and uploaded the content and course materials online. The purpose of enrolling each student online was to firstly introduce them to e-Learning. They understood that each student had different abilities and capabilities when it came to learning. This method was used to allow students the freedom to log on whenever they needed to and go over the content details in their own study time *(ibid)*.

In the past decade, nursing education has been transformed by the use of ICT as the dominant form of education and training delivery (Ajayi and Ajayi 2006). A study conducted at a university in Egypt amongst second year nursing students confirmed that e-Learning is an effective teaching method in nursing education (Abdelaziz, Samer Kamel, Karam, *et al*. 2011). A control group of students was exposed to traditional lectures and the study group used e-Learning. It was noted that students in the study group found e-Learning effective; it broadened their knowledge and understanding of the subject. However as much as this proved to be an exciting way of learning, the challenge was that not every student possessed the necessary computer skills to effectively allow them to benefit from e-Learning. It was recommended that, students should be equipped to embrace diverse ways of learning rather than relying on traditional face-to-face learning *(ibid)*.

2.5   Blended learning, e-Learning and distance education

The literature documents various types of online learning, including e-Learning, blended learning and distance education. The following paragraphs briefly describe each type.

Information and Communication Technology (ICT) has emerged as the new language of higher education institutions in recent years. e-Learning is the result of the integration of ICT in the education field (Tayebinik 2013).

Blended learning is defined as a mixture of instructional methods (Driscoll 2002). Face-to-face learning experiences are integrated with online learning experiences (Garrison and Kanuka 2004). This type of learning has been identified as a tool that can be used to redefine higher education institutions in being more learning and student centered. The literature documents that blended learning can be used to address important needs relating to the quality of communication and human interaction between students and lecturers (Bliuc, Goodyear and Ellis 2007). Blended learning is important as it allows students flexibility and is extremely convenient; it also allows working adults to obtain postgraduate qualifications (Rovai and Jordaan 2004). "Distance education is defined as the physical separation of the learner from the instructor, at least at certain stages of the learning process" (Rosenblit 2005).
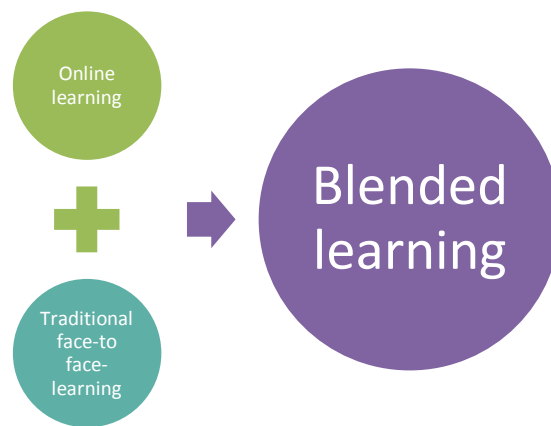
Source: Maryam Tayebinik 2013
Figure 1: Blended Learning Environment

Ginns and Ellis (2009) conclude that the blended learning method is an effective tool to complement face-to-face experiences. Oh and Park (2009) also state that blended learning is important as it allows students flexibility in accessing information. Davis and Ellis

(2007) believe that blended learning can change students' experiences and learning outcomes.

The e-Learning environment has developed gradually over the year's including developing its own online training development language (Wroten 2013). The current trends in e-Learning listed below highlights some off the recent online language that is dominating the e-Learning environment.

2.5.1 Current trends in e-Learning

The terms listed below are the current trends that dominate the e-Learning world (Wroten 2013).

2.5.1.1 MOOCs

Massive online open courses (MOOCs) are large-scale, online courses, which usually require a substantial amount of learner participation. Corporate MOOCs provide opportunities for recruiting and certification for on-the-job training.

2.5.1.2 m-Learning

Mobile learning is online training intended for use on mobile devices, like smartphones and tablets. m-Learning allows anywhere, anytime learning.

2.5.1.3 Social Learning

Social learning is currently very common, thanks to the increased role of social media in e-Learning. Some examples of social learning are Twitter chats, Skype calls and group discussions.

2.6   e-Learning at the Durban University of Technology

In response to the call for curriculum transformation by the Higher Education Qualifications Framework (HEQF), DUT initiated the Curriculum Renewal Project with the specific intention of changing course curricula and subsequently, teaching, learning and assessment across the university. e-Learning is one of the objectives of the institution's Curriculum Renewal Plan (Hiralaal 2012).

As noted in Chapter 1, the DUT Vice Chancellor's vision for the university (Bawa 2012) includes enhancing the use of e-Learning and the development of an e-Learning strategy.

Hiralaal (2012) notes that the Department of Education's White Paper on e-Education (2003) states that the introduction of e-Learning in education is an integral part of the government's efforts to improve teaching and learning across the system.

e-Learning was cultivated through communities of practice at DUT for more than ten years (Peté and Fregona, 2004, Hiralaal 2013). In 2012 DUT executive management committed to rolling out and building an infrastructure for e-Learning. An e-Learning project coordinator has been appointed; Professor Graham Stewart is charged with the responsibility to fulfil the Vice Chancellor's goal of placing at least 50% of the courses offered at DUT online by January 2015 (partly classroom based, partly online).[1] The project was initiated in May 2013 and will end in April 2015. The aim of the e-Learning project at DUT is to create and produce a "step-change" in the use of online learning (Dark 2012).

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[1] Personal communication: Project timeline at DUT, Professor Graham Stewart 2013

2013 Aug to Dec	2014	2015
•ITSS/Blackboard Server integration •Pathfinder Projects •Moodle user migration support •Blackboard training •Blackboard Mobile App trial •New e-Learning Brand launched	•Functional Blackboard classroom templates provided for all modules •Pathfinder Project Showcase •International expert symposium •One-stop student helpdesks on every campus (& online) •BB Gradebook/ITS integration	•50 to 100% of courses have online component •Each faculty to have at least one examination/ test assessment online •DUT "Digital University" marketing campaign

Source: Professor Graham Stewart, August 2013

Figure 2: Project timeline for e-Learning implementation at Durban University of Techn**ology.**

2.7   **Importance of assessing e-Learning readiness**

e-Learning readiness evaluates how ready an organization is psychologically or physically to implement e-Learning (Borotis and Poulymenakou 2004). e-Learning readiness is important because institutions and organisations are made aware of what tools are needed to facilitate e-Learning optimally (Djamaris, Priyanto and Jie 2012, Psycharis 2005, Borotis and Poulymenakou 2004, Chapnick 2000). Kaur and Zoraini Wati (2004) state that e-Learning readiness is significantly important as it is related to the accomplishments of e-Learning programmes.

2.7.1 e-Learning readiness

The Merriam-Webster Dictionary (2006) defines readiness as "the mental or physical preparation for some experience or action". Readiness is therefore defined as being "prepared mentally or physically for some experience or action" (So and Swatman 2006). Prior to implementing an e-Learning curriculum, institutions need to develop a needs assessment by creating a requirements document that includes the following important issues: objectives, an e-Learning readiness score, a list of advantages and possible disadvantages of the adoption of e-Learning and a list of possible e-Learning configurations (Kaur and Zoraini Wati 2004).

2.7.2 e-Learning readiness assessment models

An e-Learning readiness assessment is important as this allows institutions to create e-Learning policies that will enable them to implement their goals successfully and efficiently (Kaur and Zoraini Wati 2004).

A considerable number of e-Learning models have been designed over the past few years. This section reviews the different models.

Chapnick (2000) developed a model for determining the e-Learning readiness of an organization by providing answers to the following questions:

a) Are we able to do this?
b) If we are able to do this, how is it possible to achieve it?
c) What will the results be and how do we evaluate them?

This model groups different factors into eight categories:

- Psychological readiness, which focuses on an individual's state of mind as this influences the outcome of the e-Learning project. This type of readiness is regarded as being among the most significant aspects that could affect the implementation process.

- Sociological readiness recognizes the characteristics of the environment in which the programme will be conducted.
- Environmental readiness considers the forces affecting stakeholders both inside and outside the organization.
- Human resource readiness reflects on the accessibility and plan of the human support system.
- Financial readiness relates to the financial resources available in terms of budget size.
- Technological skill readiness refers to the availability of technical support.
- Equipment readiness deals with the ownership and availability of proper and appropriate equipment.
- Content readiness focuses on the substance of the curriculum being developed for teaching.

A model designed by Borotis and Poulymenakou (2004) evaluated e-Learning readiness. The model comprises of seven components; it was the outcome of the results of previous research as well as their own knowledge based on their experience.
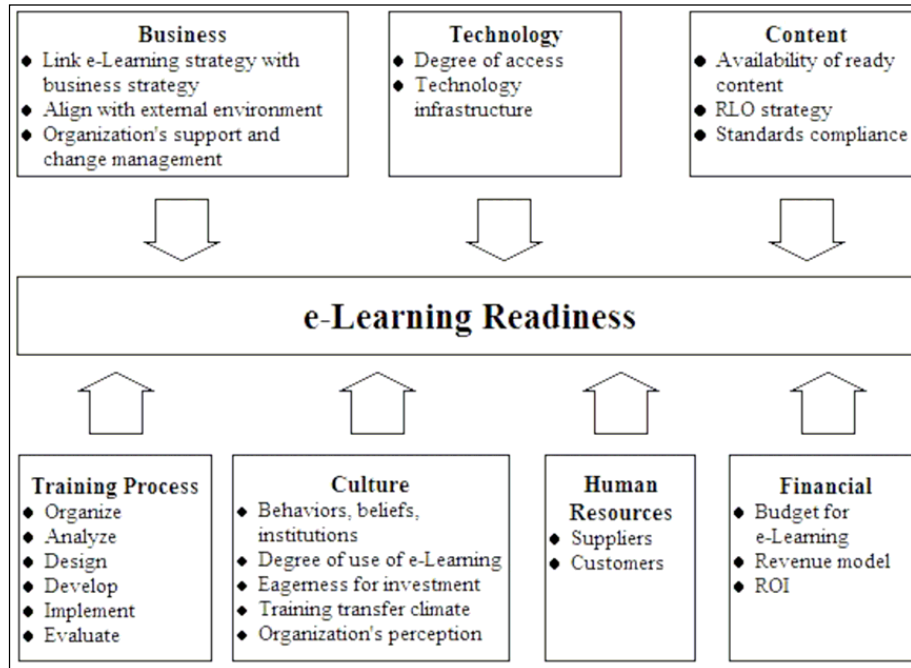
Source: Borotis and Poulymenakou, 2004.

Figure 3: The seven components of e-Learning readiness

A study conducted by So and Swatman (2008) outlined the different types of models that exist in the literature. Psycharis (2005) created a new model which was developed using the five e-Learning models designed by (Rosenberg 2000), (Chapnick 2000), (Broadbent 2001), (Worknowledge 2003), and (Borotis and Poulymenakou 2004). Psycharis (2005) grouped eight e-Learning readiness factors into three categories.
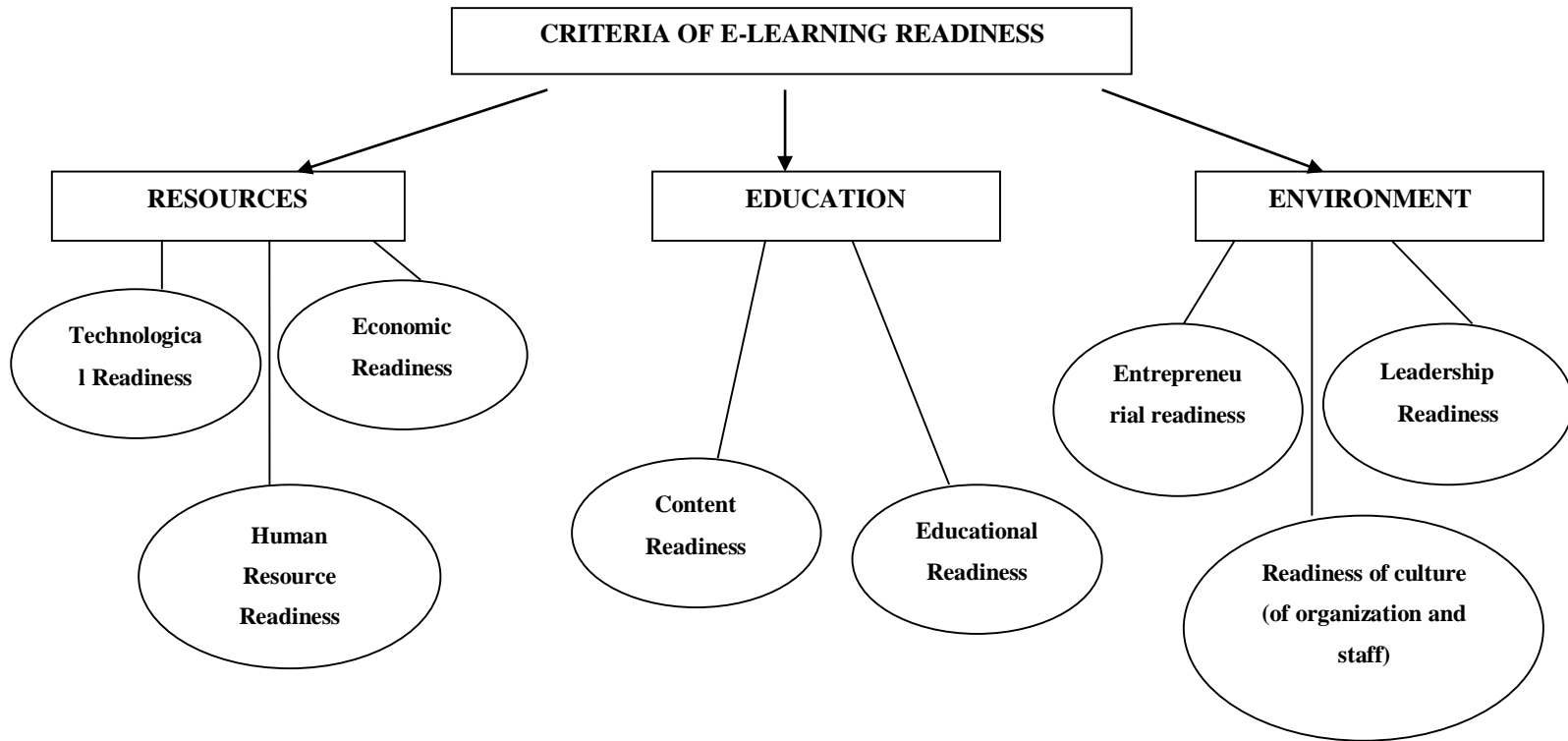
Source: Psycharis 2005

Figure 4: Criteria of e-Learning readiness

Kaur and Zoraini Watti (2004) highlighted the need for learners to be "e-ready" so that a consistent, attainable plan that is customized to meet their needs can be implemented. Using Chapnick's (2000) model as a template, Kaur and Zoraini Wati (2004) created a tool that was used to measure the e-Learning readiness of students at the Open University of Malaysia. Their tool comprised of eight constructs: Learner; Management; Personnel; Content; Technical; Environmental; Cultural; and Financial readiness in a 60 item questionnaire.

Aydin and Tasci (2005) developed an e-Learning readiness survey to assess the e-Learning readiness of companies in Turkey. A hundred companies were selected to explore whether they were ready to save costs by implementing e-Learning. The study concluded that a company could analyse its readiness for e-Learning by examining the resources it possesses as well as the skills and attitudes of employees and managers.

In summary, e-readiness assessments provide both enablers and policy makers with the capacity to formulate policies and strategies to create an e-Learning environment. Assessments are important as they provide important information to educational institutions that will help them to develop the necessary solutions that can be tailored to the specific needs of each group.

2.8   Age and e-Learning readiness

A study conducted by (Aydın and Tasci 2005) found no statistically discernible difference associated with age and e-Learning readiness scores. Similarly, Djamaris, Priyanto and Jie's (2012) study in Indonesia concluded that there was no statistically significant difference in age and perceptions of readiness for e-Learning.

2.9   Gender and e-Learning readiness

So (2008) found that gender difference is significant to any research project that focuses on technology. However a study conducted by (Haverila 2011) concluded that both genders had similar learning outcomes of e-Learning. This finding was confirmed by (Aydin and Tasci 2005, Agboola 2006, Djamaris, Priyanto and Jie 2012).

2.10 **Summary**

This chapter has provided a systematic, detailed review of the current literature on the benefits of e-Learning in general and more importantly, e-Learning in nursing education, as well as e-Learning readiness. It also summarised the Chapnick model, which the researcher has selected as the theoretical framework for this study.

3 CHAPTER III: METHODS

3.1 Introduction

This study measured the e-Learning readiness of nursing students at the Health Sciences Faculty at the Durban University of Technology prior to implementing e-Learning. The methods used in this study draw on the theories and methods of measurement developed by Chapnick (2000).

The chapter is made up of the following sections: aim, objectives, type of research and study design, target population and study population, sampling, data collection tools, data processing and analysis, validity and reliability of the designed instruments, data management and ethical considerations.

3.2 Aim

The aim of the study is to assess the level of e-Learning readiness amongst first year undergraduate nursing participants at DUT.

3.2.1 Objectives of study

The objectives of the study are to analyse e-Learning readiness amongst undergraduate nursing students, specifically in relation to psychological, technological and equipment readiness.

3.3 Type of research

This study could be categorised as applied educational research.

3.4 Study design

A quasi experimental study design was used. The design could be categorised as an Interrupted Time Series Analysis.

3.5 **Target population**

The target population can be generalised to all 1st year students at DUT, not just to nurses doing this course in anatomy and physiology.

3.6 **Study population**

The study population comprises all the B. Tech nursing students registered for a course of anatomy and physiology at DUT during 2013 (N=101).

3.6.1 **Selection of study sample**

All students enrolled in the first year nursing programme registered for anatomy and physiology were included in the study. No sampling of the study population was done. All first year nursing students were invited to participate in the study.

The first year nursing students registered for anatomy and physiology and one repeat student brought the total study sample to 101 students.

3.6.1.1 *Inclusion / Exclusion Criteria*

The inclusion criteria are:

- First year students registered in the B.Tech nursing programme at DUT;
- All first year students registered in anatomy and physiology; and
- Male and female students.

3.6.1.2 *The exclusion criteria are:*

- Students that were registered in 2010 but who have not yet passed anatomy and physiology.

3.7   **Discussion about methodology**

A quasi-experimental design was used in this study, and specifically an Interrupted Time Series Analysis. The students acted as their own controls. The students answered the pre-questionnaire before administering the intervention to assess their existing knowledge of e-Learning (control). They were then exposed a week later to the online classroom (e-Learning experience) (intervention). After the e-Learning experience, they were given the post-questionnaire to complete immediately (post-intervention). The pre-questionnaire was administered once only before the students were exposed to the online classroom. The post-questionnaire was also only administered once after the students' e-Learning experience. In an ideal Interrupted Time Series Analysis study design multiple measures may be done before and after the intervention to reduce information bias. This type of study design was selected, as it was the most convenient study design for this specific research. It was not possible to use another quasi-experimental design, the Controlled Before-and-After, as that would have required only half the class being offered the intervention. A Randomised Controlled Trial would have been the ideal study design to assess an intervention but was not feasible to implement in this context.

3.8   **Data sources**

3.8.1   Measurement instruments

An online readiness questionnaire developed by McVay (2000, 2001) focuses on students' behaviour and attitudes as predictors of online learning readiness.

McVay's questionnaire was adapted and changed to suit the nature of this study. In addition questions compiled by other researchers that were applicable to the research were adapted and included in this study (Wahab 2011, Mathew and Monica 2011) (Appendix A).

Chapnick's model was later used to assess each factor; technological, psychological and equipment readiness. Questions adapted from McVay, Wahab, Mathew and Monica addressed each readiness factor, described in Chapter 4.

The questionnaire was administered during the anatomy and physiology class time and students were instructed to answer the questionnaire in the context of their university study. The questionnaire was answered by participants choosing, along a four-point Likert scale, their level of agreement, where 1 represents a low level of agreement and 4 a high level.

3.9   Chapnick's Readiness Score Guide

The Chapnick Readiness Score Guide was adapted and used to analyse each readiness factor. The Chapnick Guide indicates that a low score for each readiness factor means that an institution is ready to implement e-Learning, while a high score indicates that an institution is not ready to implement e-Learning. However, for the purpose of this research, the Chapnick's Score Guide was adapted, whereby a high score for each readiness factor indicates that the institution is ready to implement e-Learning; if a low score is obtained, it means that the institution is not ready to implement e-Learning.

The psychological, technological and equipment readiness factors were quantified using the modified and standardized Chapnick Score Guide (Chapnick 2000) and a point value was allocated for each individual's response for each of the three readiness factors. The score for each of the readiness factors was summed, and the individual's score for each factor was combined to obtain an overall score.

Each participant was allocated 4 points for Strongly Agree' (SA), 3 for 'Agree' (A), 2 for 'Disagree' (D) and 1 point for 'Strongly Disagree' (SD). Psychological, technological and equipment readiness questions were grouped together in the questionnaire to test the participants. Each score obtained for each readiness factor evaluated was summed to obtain a total score for technological, psychological and equipment readiness. Thereafter, an overall readiness score was obtained for each participant which included the psychological, technological, and equipment readiness score to provide the overall e-Learning readiness score (Appendix H).

The scores for negative questions asked were reversed. This means that the participant received 1 point for strongly agree; 2 for agree; 3 for disagree; and 4 points for strongly

disagree (these were questions that tested psychological readiness, questions 10, 11 and 19: Appendix A).

3.9.1   Psychological Readiness Score Guide

8	20	32

Psychologically not ready   *Well, it could be worse*   *Psychologically ready*
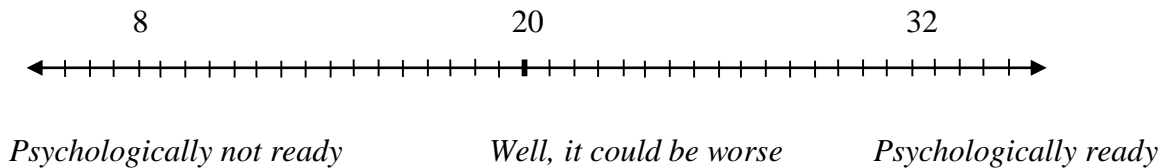
Three broad categories of psychological readiness were used:

Score 8-16:   Psychologically not ready: A lack of psychological readiness has the potential to harm a project. The psychological readiness factor cannot merely be corrected in a simplistic or short-term manner as is the case with a problem such as equipment readiness. Readiness requires a specific and complex intervention. Time may also be an important factor, as it may simply not be available, depending on issues such as the importance of the project, and the urgency of implementing it.

Score 17-23:   Well it could be worse: It is evident that elements of both support and resistance will exist. It is essential that factors causing support and resistance be monitored. This information should be used to directly address the concerns raised by those potentially resistant to the concept, while at the same time providing an incentive or reward programme to supporters of the project.

Score 24-32: Psychologically Ready: Individuals who fall into this category are psychologically ready. They will offer less or a minimal amount of psychological resistance. It is important to engage individuals who show enthusiasm for the concept, by allowing them to work in areas that may be more difficult or challenging.

3.9.2 Technological Readiness Score Guide
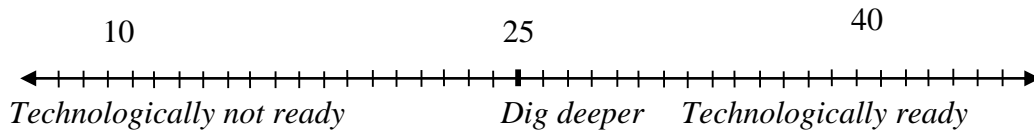
Three categories are also used for technological readiness:

Score 10-20: Technologically not ready: This constitutes a positive outcome and potential. Technological skills may be easier to obtain than a new psychological mind-set. However, it takes hard work to overcome one's unfamiliarity with technology. The advice regarding those who score between 21 and 29 should be followed, but, in addition a) prepare to allocate more resources, b) alert those stakeholders who are important and continue to keep them informed, and c) the timeline of the project may be affected and one may need to change, particularly if one has several technological aptitude concerns.

Score 21-29: Dig deeper: A greater and more thorough intensity of investigation is necessary to evaluate individuals who do not possess the necessary skills and to determine the necessary course of action. This would be the appropriate moment to include technologically skilled stakeholders if they are not already involved. At this juncture, it is essential to confront important questions. Thus, if the skills of the developers are deficient or lacking, the question is whether replacement or education constitutes the best option. If the skills of the participants are lacking, it needs to be established if there is sufficient time available for them to respond favourably, or if the initiative should be subject to modification.

Score 30-40: Technologically ready: this category indicates that only a few issues or obstacles will emerge in terms of technical skills/aptitude. It indicates that most of the participants are technologically knowledgeable. It is essential that there is an awareness of the new skills that may need to be acquired.

3.9.3 Equipment Readiness Score Guide
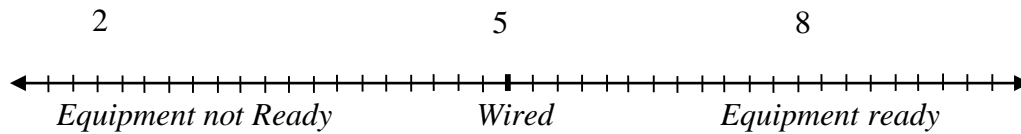
For equipment readiness 3 categories were used:

Score 2-4: Equipment not ready: This is the appropriate juncture to come up with a plan that requires each stakeholder to assess how important the e-Learning initiative is and how they will benefit from it, allowing them to provide the necessary equipment. In addition one must examine other options, including renting rather than owning the equipment and identifying companies to partner with in order to rent equipment.

Score 5: Wired: Once again, it is time to prioritize; one has to assess and come up with a strategy that identifies and highlights one's needs and outcomes in order to focus one's efforts.

Score 6-8: Equipment ready: All the necessary equipment is accessible and available. There are no concerns in this area.

3.9.4   Overall e-Learning Readiness Score Guide

When all the questions have been completed by the individuals, the points will be combined for each readiness factor to obtain an overall score.
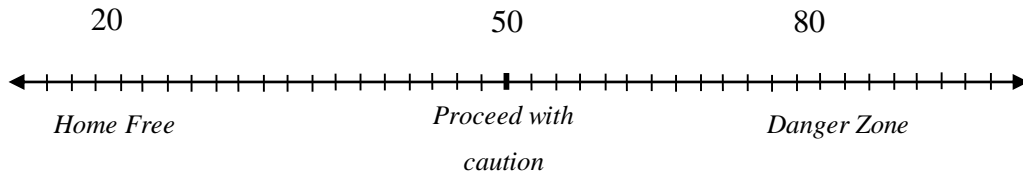
Overall e-Learning was also allocated three broad categories:

Score 20-40: Danger zone - Take a step back to re-evaluate your goals and objectives and consider whether e-Learning is the best approach to accomplish them. If your answer is yes, select your methods very carefully.

Score 41-59: Proceed with caution - You have scored in the red zone; however most e-Learning projects score in this zone. The best way forward would be to focus on which factors present a problem and which advantages can be magnified. Remember that your plan can be modified by focusing on the factors that can be changed within your capacity and those factors that cannot be changed. It is important to monitor the plan frequently.

Score 60-80: No reason to wait - An overall score this high means that much more flexibility and choice is available. Based on this score, an ideal situation exists to introduce a specific or desired business objective. Sufficient time is available and a few mistakes will not create any major ripples in the implementation plan. A high score is an ideal situation. However, any carefully considered plan can go awry. Hence, the monitoring and evaluating of these factors is extremely important.

3.10 **Measures to reduce bias and ensure internal validity**

3.10.1 Selection bias

All first year nursing students registered for anatomy and physiology were included in the study sample in order to limit selection bias. It should also be noted that students who were accepted into the B.Tech nursing programme had to qualify with their matric scores (24 points allowed them entrance into the programme). However, despite, students qualifying to be admitted into the programme with minimal requirements (4 points was allocated for Life Sciences, 4 points for Maths/Physical Science and 3 points for English), they were advantaged students but not top of the range based on their matric points achieved.

3.10.2 Information bias

A standardized questionnaire was used to ensure validity.

A customised and validated questionnaire was used to collect data. Information bias however could have occurred as not all students completed the questionnaire fully and the researcher had to contact these students to get them to complete their questionnaires.

3.10.2.1 *Pilot study*

The prepared questionnaire was piloted amongst 2012 first year nursing students at DUT. A total of 100 students were registered in the first year group and the questionnaire was completed by all students in the classroom. The questionnaire was administered towards the end of 2012, so that the data collected could be processed, analysed and interpreted. The necessary changes were made to the questionnaire.

3.10.2.2 *Missing data*

During data collection, there were some incomplete questionnaires, where students did not respond fully to all questions. To limit information bias, the researcher requested that the participants enter their student numbers on the questionnaire documents, so that if

there was incomplete information, participants could be contacted. The researcher followed up with participants who did not complete the questionnaire document correctly in order to eliminate information bias.

3.11 Measures to ensure external validity / generalisability

The study was conducted in a higher education facility in KwaZulu-Natal. This study will be limited in its generalisability. Since the study is done in one institution and at first year level only, the other faculties within DUT could apply the results of the study to first year students only.

3.12 Exposure variables

The variables in the study include age, gender, and socio-economic status. Other variables are previous exposure to computers and access to computers at participants' previous schools.

3.13 Statistical processing

3.13.1 Descriptive statistics

Categorical variables were summarized using frequency distribution and graphically displayed using appropriate graphs.

Numerical data was summarized using measures of central tendency: mean median and mode and measures of variability: range and standard deviation.

3.13.2 Analytic statistics

SPSS version 21.0 (SPSS Inc., Chicago, Illinois) was used to analyse the data. A p value <0.05 was considered as statistically significant. Frequency tables (n and %) and bar charts were generated to describe the responses to the questions. Questions were cross-tabulated (Pearson chi-square or Fischer's Exact test as appropriate) to assess the association between variables. The researcher used a Student's t-test and ANOVA to

infer numerical variables between groups (e.g. test score difference between male and female students).

3.14 Possible confounding factors

Some of the confounders may include age and gender.

3.15 List of associations to be measured

Appropriate measures of association were calculated to assess the association between gender and readiness, socio-economic status and readiness, and age and readiness. Other associations are type of school and e-Learning readiness.

3.16 Plan for data collection

The questionnaire was administered to both new and repeat students registered in the nursing department and doing anatomy and physiology.

The students' readiness for e-Learning was assessed before and after an appropriate intervention to prepare them for engaging with this new technology.

The questionnaire was first administered before students were enrolled in a Blackboard classroom to experience e-Learning. The data from the pre-questionnaire was collected, processed, analysed and interpreted. After the pre-questionnaire was administered, students were required to experience e-Learning by visiting an online classroom which was set up by the researcher, designed to create awareness of e-Learning. Students were tracked automatically. This helped to ensure that, the participants who completed the post-questionnaire had experienced exposure to e-Learning.

After this e-Learning experience, the students that completed the pre-questionnaire were asked to complete the post-questionnaire. The researcher was present during the completion of the questionnaire in order to clarify any questions that might have been unclear. The interval between administering the pre- and post-questionnaire was one week but the post-questionnaire was administered immediately after the e-Learning

experience, so there was no time for students to be influenced by their peers or have been exposed to any other influences

3.16.1 Blackboard Learning Management System[2]

The Blackboard learning management system (LMS) is used as an e-Learning platform at DUT. An anatomy and physiology online classroom was set up in Blackboard. Students were asked to log into the classroom by typing in the web address http://pilotlearn.dut.ac.za/ in their browser. They were provided with a username, which was their student number, and a password that allowed them access to the classroom. The researcher was present to help facilitate the process of students logging into the classroom. For this particular session, the cardiovascular system which had already been taught in the traditional classroom was used in the Blackboard classroom to guide students. A blended approach was used. The researcher used the Blackboard classroom as a tool to facilitate a lecture on the cardiovascular system. Some Blackboard tools such as blogging and the discussion board were used by the students to help them understand and experience the e-Learning method of gaining knowledge. Students were asked to blog about their online experience, which they found phenomenal. Compared with traditional "chalk and talk" lectures, the Blackboard online space for anatomy and physiology is a more versatile class where, for example, a video on the conduction system of the heart was made available to students.

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[2] Blackboard Inc. provides powerful and user-friendly systems for educational instruction, communication, and assessment. In the past three years, Blackboard Inc. has marketed two major product lines: the Blackboard Commerce Suite and the Blackboard Academic Suite. The core of the Academic Suite is the Blackboard Learning System, the course management system for classroom and online educational assistance (Bradford, Porciello, Balkon, *et al*. 2007).

3.17 Plan for data handling/processing

The questionnaire was collected from each student. The data was processed, summarized, analysed and interpreted. The information was entered into a Microsoft EXCEL document and later transferred into an SPSS programme for statistical analysis.

3.18 Ethics and Permission

3.18.1 Ethics

Ethical approval for this study was obtained from the Human and Social Science Ethics Committee at the University of KwaZulu-Natal, South Africa (Reference number HSS/005/013M) (Appendix F).

3.18.2 Permission

The researcher was granted permission by the DUT Research Office to conduct the research at DUT. A letter was sent to the head of the research office, Professor Moyo, requesting permission to conduct research focused on first year nursing students. The letter granting permission is attached as Appendix D. Permission was also granted by the head of the Department of Nursing programme, Dr N Sibiya (Appendix E)

3.18.3 Informed consent and participant information

Each participant was given an information sheet that highlighted the nature of the study; the researcher also explained the aim of the study verbally in person to the participants (Appendix B).They were asked to read the informed consent document and sign it. Participation in the study was entirely voluntary.

3.19 Summary

Data was collected through questionnaires, which were completed by the participants. The data required for the study was grouped into three categories to assess e-Learning readiness, namely technological, psychological and equipment readiness.

4 CHAPTER IV: RESULTS

Chapter three outlined the methods and the manner whereby the data was collected and handled. In this chapter, I present the summarised data obtained from the questionnaire that assessed the e-Learning readiness of respondents and that was administered to first year undergraduate nursing students at DUT, Indumiso Campus, during April 2013. The primary focus of the study was to establish and assess students' psychological, technological and equipment readiness to engage in e-Learning.

The results are presented for each of the specific objectives of the study. The data is summarised using appropriate tables and graphs. Bivariate and multivariate analysis was used to measure associations between students' readiness and a number of other variables.

A 4-point Likert scale was used to measure each item in the questionnaire. The responses to the Likert scale were then converted to a numeric score for each question. Four points were allocated to 'Strongly Agree' (SA); 3 to 'Agree' (A); 2 to 'Disagree' (D) and 1 point to 'Strongly Disagree' (SD). The psychological, technological and equipment readiness factors were quantified using a standardized score guide (Chapnick 2000), a tool which was adapted to suit the requirements of the study. The Chapnick's Readiness Score Guide model allocates a point value for each individual's response for each of the three readiness factors. The score for each of the readiness factors is summed, and the individual's score for each factor is combined to obtain an overall total score. Some of the questions were framed positively and some negatively. The scores were adjusted accordingly.

Pre- and post-questionnaires were administered to the undergraduate nursing students, to test and assess the change in their technological, psychological and equipment readiness before and after participating in a customised Blackboard e-Learning activity specifically designed to improve students' e-Learning readiness. The pre-questionnaire was administered first in order to test their pre-knowledge, and the post-questionnaire was

administered after the students had gained experience in the e-Learning classroom setting.

4.1 Demographic data

Aspects of the respondent's demographic profile were recorded, including gender and age. The population of 101 students comprised 77 (76%) females and 24 (24%) males. The median age of the students was 20.0 years (interquartile range 19.0 to 21.0 years). The majority (96, 96%) of the study participants were students who were registered for the first time at DUT. One student was repeating the year and three came from another faculty.

Table 1: The gender and age of the sample of health science students surveyed for e-Learning readiness at DUT in 2013

Demographic Characteristics		Frequency	Percentage
Gender	Male	24	23.8%
	Female	77	76.2%
Total		101	100%
Age (years)	<20	47	46.5%
	20-25	48	47.5%
	>25	6	6.0%
Total		101	100%

4.2   **Pre- and post-readiness scores**

The pre- and post-readiness scores comprise of questions that were asked to address each readiness factor. The questions were grouped into technological, psychological and equipment readiness. Scores were allocated on the Likert scale to SA, A, D and SD. These scores were added for each readiness factor.

4.2.1   Psychological readiness

Psychological readiness reflects an individual's state of mind in terms of being ready for an e-Learning initiative. The mental preparedness of a student is one of the most important aspects that could affect the implementation of an e-Learning process.

Table 2: Pre-and post-implementation responses to questions assessing psychological readiness for e-Learning in health science students, DUT, 2013

Elements of e-Learning Investigation	Strongly agree	Agree	Dis-agree	Strongly Disagree	Summed Score / 404	Percentage Score
Knowledge						
Pre-assessment	6	14	44	37	191	47%
Post- assessment	18	68	12	2	302	75%
Positive attitude						
Pre- assessment	14	36	37	11	249	61%
Post- assessment	25	51	12	7	196	48%
Negative perception *						
Pre- assessment	17	65	11	3	192	47%*
Post- assessment	30	51	12	7	196	48%
Fear of social isolation*						
Pre- assessment	11	55	23		190	47%*
Post- assessment	17	54	23	4	187	46%
Off campus interaction						
Pre- assessment	8	48	32	5	245	60%
Post- assessment	16	53	24	3	274	68%
e-Learning systems are easy to master						
Pre- assessment	5	47	40	5	174	43%
Post- assessment	13	66	12	8	282	70%
e- Learning vs. face-to-face learning. *						
Pre- assessment	4	20	60	5	244	60%*
Post- assessment	8	21	51	20	243	60%

Table 2 (cont.)

Elements of e-Learning Investigation	Strongly agree	Agree	Dis-agree	Strongly Disagree	Summed Score / 404	Percentage Score
Commitment to e-Learning.						
Pre- assessment	17	42	32	7	265	65%
Post- assessment	21	55	17	7	290	72%
Total score on 8 elements						
Pre- assessment					1750/3232	54%
Post- assessment					2080/3232	64%

*Indicates that the score was reversed with negative questions.

The psychological readiness for e-Learning of the study sample students in the Health Sciences Faculty was assessed before and after implementation. Descriptive statistics were used to measure the frequency of psychological readiness (Table 2). In the pre-assessment, only 47% of respondents knew what e-Learning was. The respondents were asked in a positively and negatively framed question about their attitude to e-Learning. The response was almost reciprocal, with 61% positive and 48% negative. Just less than half (46%) of the participants believed that e-Learning may lead to social isolation. Most DUT nursing students live in residence. Most (60%) thought that online learning would not be of the same quality as face-to-face learning. Only 43% in the pre-assessment noted that e-Learning would be easy to master, but despite this, two-thirds (65%) had committed themselves to e-Learning. In the post-assessment the participants' score increased from 43% to 70%; they believed that e-Learning systems are easy to master. The summed score for all 8 elements assessed in the psychological readiness component was 54%.

When asked if they viewed e-Learning positively, the participants' score decreased from 61% to 43%.

In the post-assessment, the overall score of students' knowledge about e-Learning increased from 47% to 75%. The overall score of psychological readiness changed from

54% to 64%, after participants were exposed to the e-Learning readiness classroom activity.

4.2.2 Technological readiness

This type of readiness focuses on the skills that participants will need to pursue e-Learning. Descriptive statistics were used to measure the frequency of technological readiness (Table 3).

Table 3: Pre- and post-implementation responses to questions assessing technological readiness for health science students, DUT, 2013

Element of e-Learning investigated	Strongly agree	Agree	Dis-agree	Strongly Disagree	Summed Score / 404	Percentage Score
I have a cell phone.						
Pre-assessment	65	34			362	90%
Post-assessment	62	34	2	2	356	88%
I can send an SMS.						
Pre- assessment	68	29	1		361	89%
Post- assessment	62	35	3	1	360	89%
I can use a computer.						
Pre- assessment	18	56	23	4	290	72%
Post- assessment	20	59	17	3	294	73%
School attended had computers	21	15	38	25	230	57%
Pre- assessment	16	18	35	31	219	54%
Post- assessment						
Computer training.						
Pre- assessment	14	23	43	20	231	57%
Post- assessment	9	29	37	25	222	55%
Can send e-mail.						
Pre- assessment	12	32	36	20	236	58%
Post- assessment	12	36	27	25	235	58%

Table 3 (cont.)

Element of e-Learning investigated	Strongly agree	Agree	Dis-agree	Strongly Disagree	Summed Score / 404	Percentage Score
Can send an e-mail attachment.						
Pre- assessment	16	16	43	24	222	55%
Post- assessment	12	24	33	28	214	53%
Internet access.						
Pre- assessment	28	57	13	2	311	77%
Post- assessment	22	60	10	5	293	73%
Communicating over the internet.	19	41	32	9	272	67%
Pre- assessment	17	53	21	7	276	68%
Post- assessment						
Communication Electronically.						
Pre- assessment	18	48	28	4	276	68%
Post- assessment	17	51	20	10	271	67%
Total Score on 10 elements						
Pre- assessment					2791/ 4040	69%
Post- assessment					2740/4040	68%

The assessment of technological readiness reveals that the participants do not possess the correct skills to pursue e-Learning. In the pre-assessment of technology readiness 57% of the participants stated that they had not been trained to use a computer, which reveals that they lack the mastery of the technological component required for e-Learning to function effectively.

The post assessment of technological readiness revealed that 73% of the participants agreed that they knew how to use a computer, with 54% indicating that the schools they attended did not have computers.

Asked about ownership of a cell phone and being able to send an SMS, 89% and 88% of the participants, respectively, responded positively. However whilst 73% stated that they know how to use a computer, 58% of the participants revealed that they cannot send an e-mail, and 53% indicated that they do not know how to send an e-mail attachment.

Although the participants revealed that they do have internet access (73%), only 68% stated that they are comfortable communicating with others electronically.

No change was seen in the overall score on all 10 elements from 69% in pre-assessment to 68%) post-assessment.

4.2.3 Equipment readiness

Equipment readiness refers to the ownership of proper equipment such as mobile learning devices (laptops, tablets, and computers).

Table 4: Pre-and Post-implementation responses to questions assessing equipment readiness for e-Learning in health science students, DUT, 2013

Element of e-Learning investigated	Strongly agree	Agree	Dis-agree	Strongly Dis you agree	Summed Likert Score / 404	Percentage Score
Own a computer.						
Pre-assessment	9	8	41	42	184	46%
Post-assessment	10	7	35	47	178	44%
To buy a computer.						
Pre-assessment	6	36	47	12	238	59%
Post-assessment	5	28	40	26	138	34%
Total score on 2 elements						
Pre-Assessment					422/808	52%
Post- Assessment					316/808	39%

The equipment readiness of the students in the Health Sciences Faculty was assessed before and after the said e-Learning intervention. In the pre-assessment phase, it was observed that the participants do not possess the necessary and suitable equipment to allow them to pursue e-Learning effectively (Table 4). In the post-assessment of equipment readiness, the total score dropped from 59% to 39%. The decrease in the score indicates that participants do not possess the necessary equipment required for e-Learning.

4.2.4 Psychological Readiness Score
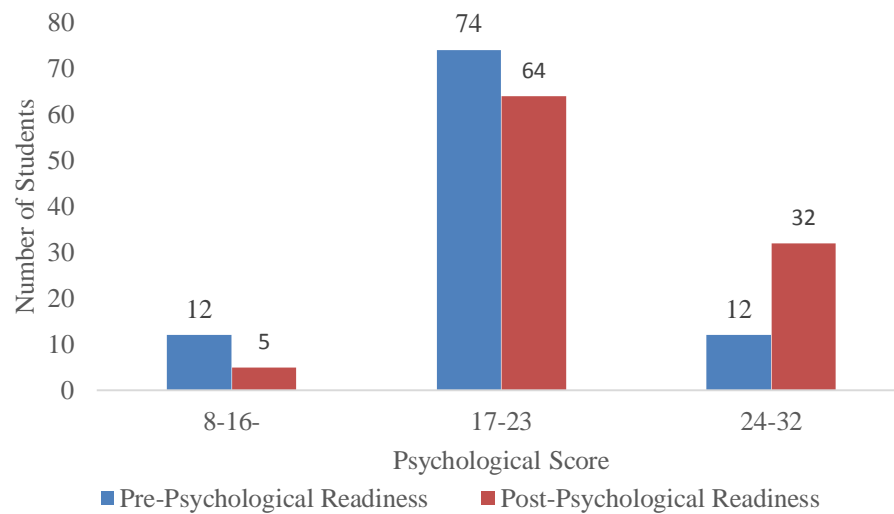
Figure 5: Pre-and post-psychological readiness score amongst nursing students at DUT, 2013 (N=101)

Most (74, 74%) of the students obtained scores between 17 and 23 (Figure 5). This is the "could be worse category". The interpretation by Chapnick would be: "despite the fact that the participants are not mentally familiar with this form of teaching and, therefore, not ready for e-Learning, they fall into a category that allows for re-evaluation of the programme, to ascertain who resistors are and those who are classifiable as supporters". The post-test score showed an increase from 12% to 32% in the psychological readiness category, which according to Chapnick would be categorised as "psychologically ready". The "could be worse" category decreased from 74% to 64% (Figure 5).

4.3 Technological Readiness Score
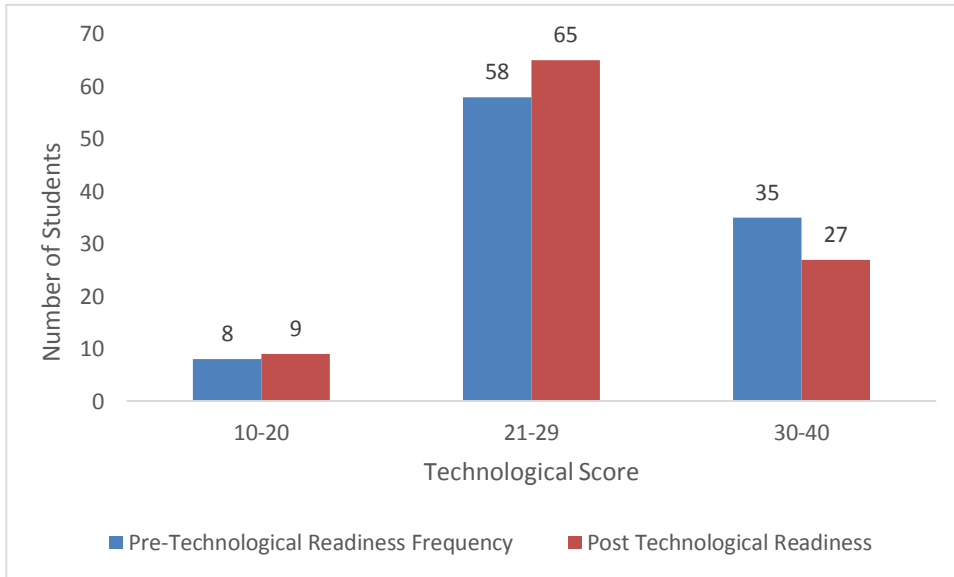
Figure 6: Pre-and post-technology readiness amongst nursing students at DUT, 2013 (N=101)

Most (58, 58%) of the students scored between 21 and 49 in the pre-technology readiness category (Figure 6). This category allows for an evaluation of how to improve their skill, and come up with contingency plans to get participants ready for the e-Learning transition. The post-technological score revealed that the proportion technologically ready increased in the 21-29 category from 58% to 65% (Figure 6).

4.4 Equipment Readiness Score
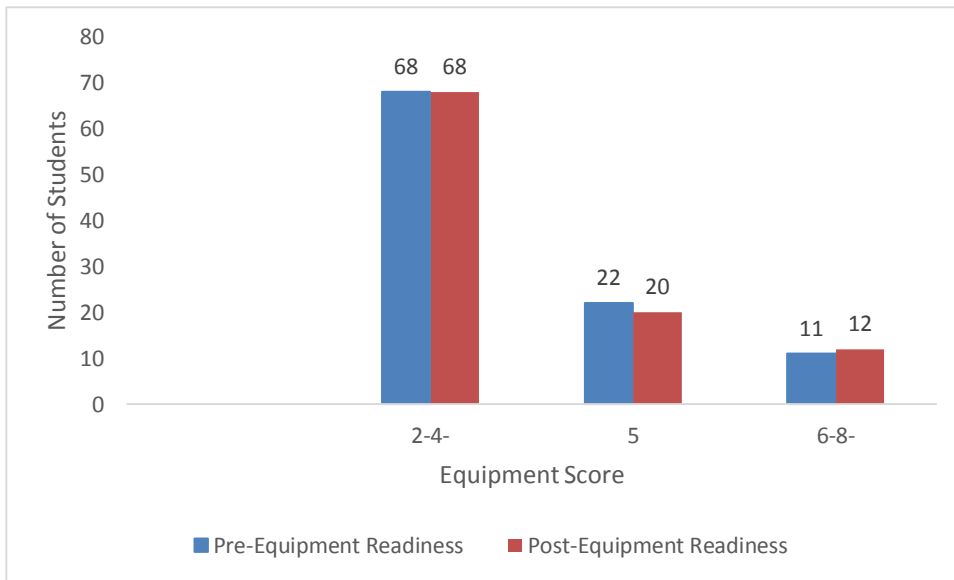
Figure 7: Pre and post-equipment readiness amongst nursing students at DUT, 2013 (N=101)

Most participants fall in the 2-4 category (68%), which illustrates that the participants are not in a state of pre-equipment readiness (Figure 7). They do not possess the right equipment to allow for a smooth transition to e-Learning. In post-equipment readiness the score did not changed (Figure 7). Participants are still not eager to equip themselves with the right equipment that will enable them to access an e-Learning classroom off campus.

4.5 Overall e-Learning readiness

Once all the questions had been completed by the participants, the points were combined for each readiness factor to obtain an overall score.
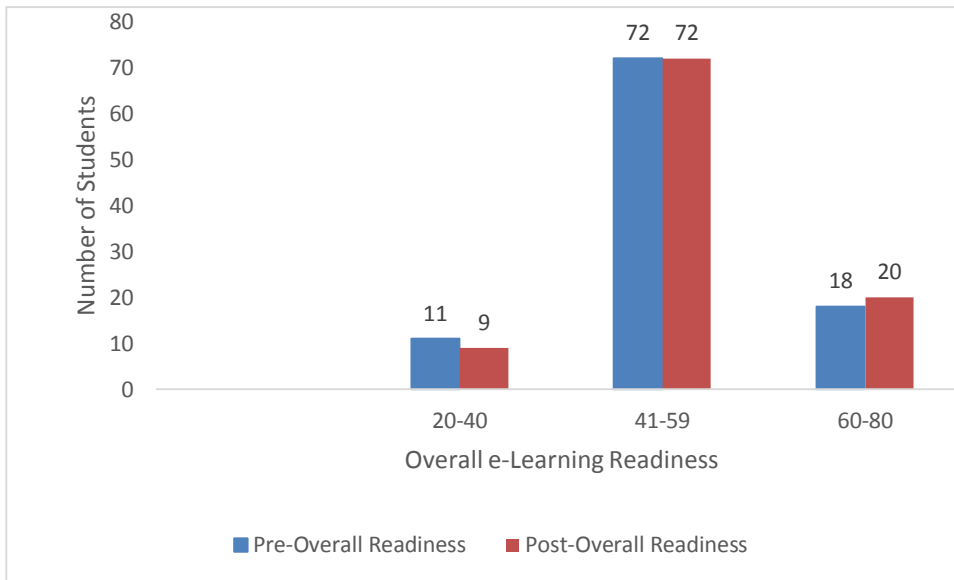
Figure 8: Pre-and post-overall readiness amongst nursing students at DUT, 2013 (N=101)

The pre-overall readiness score fell within the category of 41 to 59 (72%). This means that although the nursing students are not yet ready for e-Learning, they fall into a category in which most e-Learning projects normally score "proceed with caution". It can be seen that the post-overall readiness score did not change compared to the pre-overall readiness score, but remained at 72% (Figure 8).

4.6 Gender and e-Learning readiness

Table 5 : Gender and e-Learning Readiness in health science students, DUT, 2013

Readiness Factors	Gender	N	Mean	*P value
Pre-Technological Readiness	Male	24	27.2	0.677
	Female	77	27.7	
Post-Technological readiness	Male	24	26.5	0.597
	Female	77	27.3	
Pre-Psychological readiness	Male	24	17.8	*0.039
	Female	77	19.7	
Post- Psychological Readiness	Male	24	22.8	0.403
	Female	77	22.1	
Pre-Equipment Readiness	Male	24	4.0	0.521
	Female	77	4.2	
Post- Equipment Readiness	Male	24	3.9	0.770
	Female	77	3.8	
Pre-Overall Readiness	Male	24	49.1	0.207
	Female	77	51.7	
Post-Overall Readiness	Male	24	53.3	0.982
	Female	77	53.2	

*(p value of <0.05 was considered significant)

An independent t-test was used to measure the association between gender and each readiness factor, psychological, technological, and equipment, using the group means for each score. Statistically significant difference was noted amongst both males and females for pre-psychological readiness with a p value of 0.03 (Table 5).

4.7 Age and e-Learning readiness

Table 6: Analysis of e-Learning readiness factors based on age in health science students, DUT, 2013

Readiness Factors	Age Category	N	Mean	P value
Pre-Technological Readiness	less than 20	47	28.5	0.266
	20-25	48	26.6	
	greater than 25	6	28.1	
	Total	101	27.6	
Post-Technological Readiness	less than 20	47	28.6	*0.031
	20-25	48	25.5	
	greater than 25	6	27.5	
	Total	101	27.1	
Pre-Psychological Readiness	less than 20	47	19.2	0.696
	20-25	48	19.2	
	greater than 25	6	20.6	
	Total	101	19.3	
Post Psychological Readiness	less than 20	47	22.5	0.886
	20-25	48	22.1	
	greater than 25	6	22.1	
	Total	101	22.3	
Pre-Equipment Readiness	less than 20	47	4.2	0.339
	20-25	48	4.0	
	greater than 25	6	4.6	
	Total	101	4.1	
Post-Equipment Readiness	less than 20	47	4.2	*0.034
	20-25	48	3.4	
	greater than 25	6	3.6	
	Total	101	3.8	
Pre-Overall Readiness	less than 20	47	52.1	0.390
	20-25	48	49.9	
	greater than 25	6	53.5	
	Total	101	51.1	
Post-Overall Readiness	less than 20	47	55.4	0.075
	20-25	48	51.2	
	greater than 25	6	53.3	
	Total	101	53.3	

*(p value of <0.05 was considered significant)

One way ANOVA testing was done to evaluate if there was any statistical difference amongst the different age categories against each readiness factor. As shown in Table 6, statistically significant difference was noted amongst the three age categories on post-technological readiness with a p value of 0.031. A post hoc test (Tukey) was carried out to assess which age categories were different and it was found that the difference was between the less than 20 and 20-25 category.

Statistically significant difference was also observed amongst the three age categories on post-equipment readiness with a p value of 0.034. A post hoc test (Tukey) was carried out to assess which age categories were different and it was found that the difference was between the less than 20 and 20-25 category (Table 6).

4.8   **Type of school and readiness**

Table 7: Analyses of each e-Learning readiness factor based on type of school in health science students, DUT, 2013

Readiness Factors	Type of Schools	N	Mean	P value
Pre-Technological Readiness	urban	27	29.7	*0.001
	rural	61	25.7	
	other	13	32.0	
	Total	101	27.6	
Post-Technological readiness	urban	27	28.8	*0.001
	rural	61	25.3	
	other	13	32.1	
	Total	101	27.1	
Pre-Psychological Readiness	urban	27	19.8	0.099
	rural	61	18.7	
	other	13	21.1	
	Total	101	19.3	
Post-Psychological Readiness	urban	27	21.8	0.085
	rural	61	22.1	
	other	13	24.3	
	Total	101	22.3	
Pre-Equipment Readiness	urban	27	4.6	*0.002
	rural	61	3.8	
	other	13	4.6	
	Total	101	4.1	

Table 6 (cont.)

Readiness Factors	Type of Schools	N	Mean	P value
Post- Equipment Readiness	urban	27	4.1	*0.027
	rural	61	3.5	
	other	13	4.6	
	Total	101	3.8	
Pre-Overall Readiness	urban	27	54.1	*0.001
	rural	61	48.3	
	other	13	57.8	
	Total	101	51.1	
Post-Overall Readiness	urban	27	54.8	*0.001
	rural	61	50.9	
	*other	13	61.0	
	Total	101	53.3	

*other: Model C and private schools.   *(p value of <0.05 was considered significant)

One way ANOVA testing was done to evaluate the type of school against each readiness factor. Statistically significant difference was observed amongst the different types of schools. Statistical significance was observed amongst the pre-technological and post-technological readiness factor with a p value of 0.001. A post hoc test (Tukey) was carried out to assess which type of school was different and it was found that rural schools were different from urban schools and other schools in the technological readiness factor (Table 7).

Statistically significance was also observed amongst the pre-equipment and post-equipment readiness factor with a p value of 0.002 and 0.027, respectively (Table 7). A post hoc test (Tukey) was carried out to assess which type of school was different and it was found that rural schools were different from urban schools and other schools in the equipment readiness factor.

Statistically significance was also observed amongst the pre- and post- overall readiness factors with a p value of 0.001, respectively (Table 7). A post hoc test (Tukey) was carried out to assess which type of school was different and it was found that rural schools were different from urban schools and other schools in the overall readiness category.

4.9 Computer skills and e-Learning readiness

This association will be measured by looking at the questions that asked whether the participants had previous exposure to computers at their schools.

Table 8 : Exposure to computers, e-Learning readiness in health science students, DUT, 2013

Readiness Factors	Did the school you attend have computers?	N	Mean	*P values
Pre-Technological Readiness	Yes	51	30.3	*0.001
	No	48	24.6	
Post-Technological Readiness	Yes	51	29.4	*0.001
	No	48	24.7	
Pre-Psychological Readiness	Yes	51	19.6	0.468
	No	48	19.0	
Post-Psychological Readiness	Yes	51	22.6	0.289
	No	48	21.9	
Pre-Equipment Readiness	Yes	51	4.3	0.154
	No	48	3.9	
Post-Equipment Readiness	Yes	51	4.0	0.154
	No	48	3.6	
Pre-Overall Readiness	Yes	51	54.2	*0.001
	No	48	47.6	
Post-Overall Readiness	Yes	51	56.1	*0.001
	No	48	50.3	

*(p value of <0.05 was considered significant)

An independent t-test was used to measure the association between exposure to computers and each readiness factor, psychological technological, and equipment, using

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group means for each score. Statistically significant difference was noted for pre-technological and post-technological readiness with a p value of 0.001, respectively. Statistically significance was also observed for pre-overall readiness and post-overall readiness with a p value of 0.001 (Table 8).

4.10 **Socio-economic status**

Socio-economic status was measured by assessing two sets of questions:

1. Did the school you attend have computers? and
2. The type of school the participant attended.

Forty eight percent of the participants did not have computers at the school that they attended (Table 8), and 60% of the participants did not attend computer classes at their secondary schools (Table 9).

The school quintile system is a rating mechanism designed by the South African government to evaluate schools according to a poverty ranking system. Schools are divided into 5 quintiles based on their poverty ranking. Quintile ranking is important as this identifies no fees school. Quintiles 1, 2 and 3 are identified as no fees schools, while Quintile 1 is the poorest schools and Quintile 5 is the least poor schools. 58% of the participants attended quintile schools that are disadvantaged (Table 10).

Hence, socio-economic status was measured using these standards (a more detailed table is attached as Appendix G that lists the different names of the schools, together with the quintile and number of participants that attended each school).

Table 9: Frequency highlighting how many participants were exposed to computers, in health science students, DUT, 2013

Readiness Factors	Did the school you attend have computer classes?	N	Mean	P Value
Pre-Technological Readiness	Yes	39	31.3	*0.001
	No	60	25.0	
Post-Technological readiness	Yes	39	30.7	*0.001
	No	60	24.7	
Pre-Psychological readiness	Yes	39	20.6	*0.003
	No	60	18.3	
Post-Psychological Readiness	Yes	39	23.2	*0.039
	No	60	21.8	
Pre-Equipment Readiness	Yes	39	4.4	*0.041
	No	60	3.9	
Post- Equipment Readiness	Yes	39	4.2	*0.023
	No	60	3.5	
Pre-Overall Readiness	Yes	39	56.5	*0.001
	No	60	47.3	
Post-Overall Readiness	Yes	39	58.2	*0.001
	No	60	50.1	

*(p value of <0.05 was considered significant)

An independent t-test was used to measure the association between exposure to computers and each readiness factor, psychological technological, and equipment, using group means for each score. Statistically significant difference was noted for pre-technological and post-technological readiness with a p value of 0.001, respectively. Statistical significant difference was noted for pre-psychological and post-psychological readiness with a p value of 0.003 and 0.039, respectively. Statistical significance was also observed for pre-equipment and post-e-equipment readiness with a p value of 0.041 and

0.023, respectively. Statistically significance was also observed for pre-overall readiness and post-overall readiness with a p value of 0.001, respectively (Table 9).

Table 10: Analyses of each e-Learning readiness factor based on school quintile in health science students, DUT, 2013

Readiness Factors	School Quintiles	N	Mean	P Value
Pre-Technological Readiness	Quintile 1	23	25.4	*0.003
	Quintile 2	20	26.1	
	Quintile 3	15	26.2	
	Other	42	30.1	
	Total	100	27.6	
Post-Technological readiness	Quintile 1	23	23.8	*0.001
	Quintile 2	20	25.8	
	Quintile 3	15	25.7	
	Other	42	30.0	
	Total	100	27.1	
Pre-Psychological readiness	Quintile 1	23	17.5	*0.010
	Quintile 2	20	18.2	
	Quintile 3	15	19.7	
	Other	42	20.6	
	Total	100	19.3	
Post-Psychological Readiness	Quintile 1	23	21.1	0.085
	Quintile 2	20	21.6	
	Quintile 3	15	22.2	
	Other	42	23.3	
	Total	100	22.3	
Pre-Equipment Readiness	Quintile 1	23	3.9	*0.018
	Quintile 2	20	3.9	
	Quintile 3	15	3.7	
	Other	42	4.6	
	Total	100	4.1	
Post-Equipment Readiness	Quintile 1	23	2.9	*0.001
	Quintile 2	20	3.9	
	Quintile 3	15	3.5	
	Other	42	4.4	
	Total	100	3.8	

Table 10 (cont.)

Readiness Factors	School Quintiles	N	Mean	P Value
Pre-Overall Readiness	Quintile 1	23	46.9	*0.001
	Quintile 2	20	48.2	
	Quintile 3	15	49.6	
	Other	42	55.4	
	Total	100	51.1	
Post-Overall Readiness	Quintile 1	23	48.0	*0.001
	Quintile 2	20	51.4	
	Quintile 3	15	51.5	
	Other	42	57.7	
	Total	100	53.2	

*(p value of <0.05 was considered significant)

One way ANOVA testing was done to evaluate the school quintile against each readiness factor. Statistically significant difference was observed amongst the different types of school quintiles. Statistical significance was observed amongst the pre-technological and post-technological readiness factor with a p value of 0.003 and 0.001 (Table 10). A post hoc test (Tukey) was carried out to assess which school quintile was different and it was found that for pre-technological readiness Quintiles 1 and 2 are different from other. In terms of post-technological readiness the post hoc test found that Quintiles 1, 2 and 3 were different from other.

Statistical significance was also observed amongst the pre-psychological readiness factor with a p value of 0.010 (Table 10). A post hoc test (Tukey) was carried out to assess which school quintile was different and it was found that for pre-psychological readiness, Quintile 1 was different from other.

Statistical significance was also observed amongst the pre-equipment readiness factor and post-e-equipment readiness factors with a p value of 0.018 and 0.001 (Table 10). A post hoc test was carried out to assess which school quintile was different for post-equipment readiness factor; it was observed that school Quintile 1 was different from other.

Statistical significance was also observed amongst the pre- and post-overall readiness factors with a p value of 0.001, respectively. A post hoc test (Tukey) was carried out to assess which type of school quintile was different and it was found that for pre- and post-overall readiness factors, Quintiles 1 and 2 are different from other.

4.11 **Summary**

This chapter presented the results of the study that showed statistical significance on a number of variables associated with e-Learning readiness factors. Statistically significant difference was noted amongst the male and female participants for pre-psychological readiness.

5 CHAPTER V: DISCUSSION

This chapter discusses each objective of the study, based on Chapnick's Readiness Score Guide. Each readiness factor will be explained and discussed. Conclusions and recommendations are thereafter drawn from the main issues arising from the study.

5.1 Introduction

The main objective of this study was to assess e-Learning readiness by examining three readiness factors, namely psychological, technological and equipment readiness.

5.2 Psychological readiness

Chapnick (2000) describes psychological readiness as a person's state of mind regarding e-Learning.

In the pre-assessment of the psychological readiness category, it was noted that the score range was highest in the 17-23 category (74%). This category is identified as the "could be worse category" (Figure 4 of Chapter 4). Although the participants are not mentally familiar with this form of teaching and therefore, do not fall in the "ready category" for e-Learning, they fall into a category that allows for re-evaluation of the programme in order to ascertain who the resistors are and those who are classifiable as supporters.

In the post-assessment for psychological readiness it can be clearly seen (Figure 4 of Chapter 4), that there was an increase from 12% to 32% in the psychologically ready category, which indicates that more participants are psychologically ready. In the 17-23 category readiness decreased from 74% to 64%. Although participants are moving towards becoming psychologically ready, there is still a need for evaluation.

A study conducted by Pingle (2011) in India, concurs that having the right attitude is extremely important for the successful implementation of an e-Learning programme. She defines attitude towards e-Learning as the way in which a learner perceives, believes, reasons and imagines the e-Learning programme.

Broadbent (2002) concurs and states that successful implementation of e-Learning within an institution means having the right people at the right place with the right resources. Worknowledge (2004) observes that it is important to explore the readiness of staff. This is in line with Chapnick's psychological readiness in terms of having the right frame of mind to implement e-Learning.

5.3   **Technological readiness**

Chapnick (2000) describes technological readiness as an individual possessing a certain degree of technical competencies that can be observed and measured.

The pre-technology readiness score is high in the 21 to 49 category (58%) (Figure 5 of Chapter 4). The first year nursing students do not fall into the "ready for technology readiness category" but they do fall in the 'dig deeper category". This means that a more in-depth investigation is required to highlight those individuals who do, and do not possess the necessary skills and what course of action needs to be taken. Before proceeding it would be wise at this stage, to confront important questions. Consequently, if the skills of the developers are lacking, the question is whether replacement or education is the best option. If the participants lack skills, it should be ascertained whether there is sufficient time available for them to react positively, or if the programme should be adjusted.

The post-technological score showed that there was an increase in the 21-29 category. The frequency went from 58% to 65 % (Figure 5 of Chapter 4).

This score range indicates that, although the first year nursing students are not yet technologically ready, they fall into a category where they are moving forward - with a few necessary changes the technology readiness factor can move to the "technologically ready" category (Chapnick 2000). The findings of this study differ from the research conducted by Mitra (2005) in which he states that children can learn how to use public computers on their own. He demonstrated this through his "hole in the wall projects" whereby he created a public space where computers were installed and accessible to children. He claimed that groups of children are able to teach themselves how to use

computers if they are provided with the technology. He also concluded by stating that these computer facilities should be allocated in a secure and safe environment *(ibid)*. He strongly believes that the "hole in the wall projects" are important as this allows individuals to become computer literate in areas where orthodox training is not available.

A study conducted by Hussein Ali (2010) corroborates with the findings of this study. He conducted a study in Egypt amongst tourism and hotel students found that a learner must have a certain degree of computer and technological skills to be able to survive in an e-Learning environment. He adds that it is imperative for a student to possess basic computer skills to achieve success in an online environment.

The results of our study reflect the findings of Karmakar and Wahid's (2000) assessment which looked at technology readiness in Bangladesh. This study pointed out that, e-Learning is based on technology which involves the computer and the Internet. They observed that the education sector in Bangladesh would benefit from e-Learning as it would provide improved technological support for learners.

Borotis and Poulymenakou (2008) highlighted the importance of technology and content. They claimed that technology that is compatible with e-Learning standards is important, as this will allow interoperability *(ibid)*. They further described the technology acceptance model (TAM) where a learner's satisfaction is assessed, and is based on the acceptance and usage of e-Learning tools.

Borotis *et al.* (2004) also developed a model that examined technological readiness as one of their e-Learning readiness factors. Based on this model, Psycharis (2005) concurred that it is vital for an institution to explore technological readiness before implementing e-Learning. The Psycharis model categorized technological readiness into resources that includes the accessibility of the Internet, the availability of human resources who would assess the skills and knowledge that participants who are involved in e-Learning possess. Technophobia is one of the reasons that limit an institutions ability to implement e-Learning (Aydin and Tasci 2005). Rossiter and Watters (2000) conclude that there is a need for higher education institutions to address the issue of technological readiness by formally including it into their planning and delivery of their academic

programs. This will enable students to develop the necessary skill sets required for self-sufficiency in an e-Learning environment.

Link and Marz (2006) propose that to prevent students from developing "computer-hostile attitudes" there should be a preventative measure set in place that would allow students the opportunity to equip themselves with the basic knowledge of using a computer. Preventive measures should include introducing computer courses that would enable the students to gain the basic skill required to survive in an e-Learning environment. Their conclusion is that students need to have adequate computer knowledge to avoid the frustrations experienced when trying to access an online classroom.

5.4   Equipment readiness

Chapnick (2000) describes equipment readiness as possessing the proper equipment necessary to implement e-Learning.

Most of the participants in this study fall in the 2-4 category (pre and post 68%); this indicates that participants fall into the "equipment not ready" category. Participants do not possess the right equipment for a smooth transition to e-Learning.

This is the suitable moment for an institution to come up with a plan that will require the participation of each stakeholder. It is vital to analyse the importance of e-Learning and how it will benefit the programme or institution. It is important to note that the proper equipment is necessary for the implementation of e-Learning for first year nursing students at DUT. In addition one could explore other alternatives such as marketing the e-Learning initiative that would attract investment from companies; this will enable the student or the institution to rent rather than own the equipment. Companies could be identified and approached as possible partners (2013).

Aydin *et al.* (2005) the importanc for an institution to implement e-Learning they should have the proper hardware (access to computers) necessary to facilitate this process.

Oliver and Towers (2000) concurs by stating without proper equipment it is difficult if not impossible to adopt and implement e-Learning within an institution.

5.5 **Overall readiness**

The overall readiness for both pre-and post-assessment fell within the category of 41 to 59 (72%). Chapnick (2000) describes this category as "proceed with caution". Chapnick (2000) advocates that most organizations and institution fall into this category. Based on her model, Chapnick (2000) advices that it is important for an institution to evaluate what factors are preventing the migration for an institution to be ready to implement e-Learning.

5.6 **Gender and readiness**

Statistically significant difference was noted amongst males and females for pre-psychological readiness, with females being more ready (Table 5).

Pingle's (2011) study at the University of Mumbai in India examined higher education students' readiness for e-Learning based on gender. She recorded that male students show more readiness for e-Learning than female students.

Ong and Lai (2006) conclude that by gaining deeper insight into gender differences in students' attitudes towards computers, teachers would be better able to encourage and track students' learning progress in terms of gender.

In contrast, Haverila's (2011) study found that both genders perceive e-Learning readiness in similar ways. Similar studies have found no statistically discernible difference associated with gender and e-Learning readiness scores (Aydın and Tasci 2005),(Agboola 2006; 2013), (Djamaris, Priyanto and Jie 2012).

It is imperative that researchers gain insight into the gender differences of users, as this is important information that can be analysed in order to plan.

5.7 Age and readiness

The present study found that there was a statistically discernible difference associated with age and e-Learning readiness scores. Statistically significant difference was noted amongst the three different age categories in terms of post-technological readiness with a p value of 0.031 and in post-equipment readiness with a p value of 0.034. A post hoc (Tukey) test revealed that for both readiness factors analysed, the difference was found between the less than 20 and 20-25 category. These findings are different from the studies reported in the literature (Aydın and Tasci 2005), (Djamaris, Priyanto and Jie 2012) that concluded that there was no statistically significant difference in age towards observations of readiness towards e-Learning.

5.8 Socio-economic status

For the purpose of this research, socio-economic status was measured by examining different factors, including: the type of school participants attended; the quintile that the school belonged to; and whether or not the schools the participants attended had computers and computer classes.

Most of the participants attended rural schools. The majority of the participants also attended schools that belonged to the disadvantaged quintiles (refer to Table 10 in Chapter 4). 58% attended schools that are disadvantaged.

Furthermore 48% of the participants did not have computers in their schools and table 10 in Chapter 4 shows that 60% of the participants did not attend computer classes at their secondary schools.

McVeigh (2009) observes that a lack of computer training creates barriers to accessing the Internet. The literature records that many nurses have high levels of computer anxiety as they grew up in a pre-computer age (Kenny 2000).

5.9   Limitations

This study was conducted on a small scale using first year nursing students. Its findings can therefore only be used for first year students in other faculties.

While a pilot study was conducted towards the end of 2012 using 100 first year students, the researcher did not statistically analyse all 100, which would have given the researcher a clearer indication of how to make necessary changes based on the results. The questions in the questionnaire were adapted, but if the researcher had used the whole study sample and not randomly selected 20 participants from the sample, she might have gained a clearer perspective on how to make the necessary changes that arose during the study.

We used Chapnick's' model that comprises eight factors that are used to assess if an institution or organisations readiness to implement e-Learning. Since time was a limiting factor for the researcher for this research conducted for academic purposes, only three of the eight factors were selected to be assessed. We acknowledge having only used three measures could have reduced the validity (accuracy) of the study, and as such may not reflect the 'truth'. Having a sample of only 100 students answering three questions may have also reduced the precision or reliability of assessment of e-Learning readiness. The three factors selected were chosen specifically for this particular group of students, based on a pilot study conducted in the previous year.

5.9.1   External validity

5.9.1.1   *Information bias*

A standardized questionnaire was used to ensure validity. A customised and validated questionnaire was used to collect data (Refer to Chapter 3). Information bias is potentially one of the limitations experienced in this study. Some students had to be called back to complete the questionnaires. It is possible that the students could have discussed the questions with their colleagues and this could have changed some of their initial answers if they had completed the questionnaire prior to possible discussing the survey with peers.

5.9.1.2 *Selection bias*

All first year nursing students registered for anatomy and physiology were included in the study sample in order to limit selection bias (Refer to Chapter 3 for a more descriptive explanation regarding external validity). The researcher would also like to state that selection bias was identified as another limitation experienced as all students who are accepted into the B.Tech nursing programme did have to apply using their M Scores. Although the minimum entrance that qualifies a student acceptance into the B.Tech nursing programme is 24 points (4 points for Life sciences, 4 points for Maths/Physical Sciences and 3 points for English), this however does not qualify a student for the e-Learning encounter and experience. Since most of the students are from quintiles 1, and 3 schools (Appendix G). These schools were identified as the low socio-economic schools with no access to the computers or computer training (refer to Table 8 of chapter 4).

5.9.2   Internal validity

The study was conducted in a higher education facility in KwaZulu-Natal. This study will be limited in its generalisability. Since the study was conducted at one institution and at first year level only, other DUT faculties could apply its results to first year students only.

5.10 Summary

This chapter discussed the statistical significance of psychological, technological and equipment readiness. Each readiness factor was investigated and discussed. Equipment readiness was identified as the readiness factor that most participants had a problem with. Attaining proper equipment whether laptops, tablets or computers was a problem as most of the students come from poor socio-economic backgrounds and cannot afford such equipment.

6 CHAPTER VI: RECOMMENDATIONS AND CONCLUSIONS

6.1 Introduction

"Every research study, particularly educational research, is limited in some way" (Harrell 2005). This study was conducted at DUT among first year nursing students registered for anatomy and physiology. Firstly, it is a small scale study and the sample was drawn for a specific subject. Subjective experiences and module content may have contributed to students' perception related to e-Learning as I used a learning area that was previously taught in a traditional way in the classroom. The pilot study that was conducted in 2012 by the researcher should have been analysed more closely and provision should have been made based on the pilot; however, due to time constraints and the nature of the nursing programme the researcher did not analyse all 100 students. The questionnaire was adapted but the questions could have been made clearer. If the researcher could change the questionnaire for future studies, it would be adapted slightly differently (Appendix I).

6.2 Psychological readiness

Psychological readiness is defined by Chapnick (2000) as a type of readiness which places emphasis on an individual's state of mind; this can influence the outcome of the e-Learning initiative. How one perceives e-Learning can create a positive or negative attitude to how one embraces e-Learning. This type of readiness is regarded as one of the most important and substantial factors that could impact the implementation process.

The results within the context of this specific research demonstrated that although participants are moving towards becoming psychologically ready, continuous assessment is required in order to promote a smooth transition from a more traditional form of learning to a more blended classroom.

6.3　**Technological readiness**

Chapnick (2000) describes technological readiness as participants' possessing the right technological skills. This means that participants will know how to use the online Blackboard classroom.

It is important to highlight that whilst e-Learning makes it possible to teach nursing students using different styles, including independent learning and blended learning the researcher's findings demonstrated that most students come to tertiary institutions without previous knowledge or computer skills. e-Learning can play an important role in equipping students with the necessary skills that they need to succeed in the nursing environment. The researcher is aware of the continuous change associated with technology, it is therefore important that nursing educators engage students through e-Learning.

6.4　**Equipment readiness**

This study found, that, majority of the students do not possess the proper equipment to access the online Blackboard classroom. Chapnick (2000) describes equipment readiness as having the proper equipment to facilitate the transition to e-Learning.

6.5   Recommendations

6.5.1   Technological readiness

The implementation of e-Learning is a necessity for any higher education institution that seeks recognition as a 21st century university. e-Learning sets the pace for how students will learn. Maximizing e-Learning is very important as it will attract many different types of students and determine their success. This study found that the participants are not technologically ready to fulfil e-Learning requirements. Based on these findings, the researcher recommends that students should be supported to develop computer skills, for example through an introductory computer course that will enable them to acquire the basic tools required in the classroom. In Thailand, a university reviewed its syllabus and included e-Learning as part of an introductory course that all first year undergraduate nursing students had to complete (Sanluang, Sngounsiritham, Poungsombat, *et al.* 2008). Link and Marz (2006) also suggested that a computer course should be included into a curriculum for their students as to avoid students developing "computer-hostile attitudes". Their suggestion was to have computer classes embedded into the curriculum and not as a once of single class.

At DUT and more specifically the education department at the Indumiso campus, e-Learning has been integrated into the syllabus and first year undergraduate students are required to complete a three-month e-Learning course (Hiralaal 2012, 2013).

6.5.2   Equipment Readiness

The researcher notes that, while e-Learning is valued by undergraduate nursing students, they lack equipment. The researcher recommends within the context of this specific research that equipment should be made available for e-Learning in order to ensure the success of this mode of learning.

e-Learning is not only technology driven; its successful implementation in nursing education requires that the benefits and limitations of e-Learning be evaluated by both users and executors (McVeigh 2009). Based on this fact and the various studies

documented in the literature, in order to implement and facilitate effective e-Learning, educators need to proceed with caution, bearing in mind that proper technology is the key to implementing e-Learning successfully (McVeigh 2009, Link and Marz 2006, Chapnick 2000, Borotis and Poulymenakou 2004, Psycharis 2005).

It is important to acknowledge that students require the proper resources to make optimum use of materials; therefore it is imperative that the institution supports students by providing them with the hardware required to facilitate the e-Learning initiative. The Chapnick model advocates that institutions should market their e-Learning project and team up with major software companies that will lease them equipment. This provides for a more controlled environment and a more firm hold on the use of equipment. The *Sunday Times* (3 December 2013) recently reported that the University of Johannesburg has partnered with Eduloan to provide laptops and tablets to their 2014 student cohort. Students are required to have this equipment and affordable repayment plans will be put in place according to the students' means.

Based on the Chapnick model and the University of Johannesburg initiative, the researcher recommends that DUT partner with external computer companies to facilitate the leasing of equipment or even to add the cost of purchasing a computer to students' levies; if a student is funded by the National Student Financial Aid Scheme (NSFAS), this would be included in their fees.

6.6 Recommendations for further study

This findings of this study was analysed using the Chapnick model (2000). The Chapnick model explores eight readiness factors, the researcher only looked at three factors due to the limitation of time. It would be recommended that for future research the other five readiness factors (sociological, environmental, human resource, financial and content) should also be explored to find out in totality how ready an institution is to implement e-Learning.

A quasi-experimental interrupted time series analyses was used to conduct the research. Due to the time implications for completion of this degree the researcher could only

conduct one pre-questionnaire before the intervention and one post questionnaire after the intervention was conducted. It is recommended that whilst time was a limiting factor, for future research the pre-questionnaire should be attempted at least 3 times before the intervention to reach a level of consistency and once the intervention has been conducted the post questionnaire should be attempted at least 3 time to reach a level of consistency with the answers provided by the students. The researcher also recommends that a randomised control trial study design could be used.

Selection bias was also identified as a limitation in this specific study, for future research it would be ideal to use all first years from other faculties within the DUT, as the M Scores for entrance into different departments within each faculty of DUT will be different. This could limit selection bias.

In addition information bias was identified as being a limitation in this study, for future research it should be recommended that students should anonymously complete the questionnaire.

6.7 **Summary**

This chapter summarised psychological, technological and equipment readiness. The researcher concluded that the in order for there to be a smooth transition in implementing e-Learning, each student should be equipped with proper equipment that will help facilitate this migration.

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8   Appendices

8.1   **Appendix A: Questionnaire**

A. Characteristics of Student

Note: Please use a tick in the appropriate box.

1) .Please provide information on your current status

	Yes	No
A. New Student (First year at D.U.T)		
B. Repeat Student		
I. Student that came from another faculty		
II. Student that transferred from another university		

2) Gender

Male	
Female	

3. Date of Birth

Day	*Mm*	*yr*

Current Age (in years)

4. The type of school that you went to prior to university entrance.

Type of School		Yes	No
Urban			
Rural			
Model C			
Private			
Home-schooled			
Boarding school	Rural		
	Urban		

5. Did the school you attend have computers? Yes/No

6. Did the school you attend have computer classes? Yes/No

7. Did you enter DUT directly after obtaining your Senior Certificate /matric? Yes/No

8. If you did not attend school the year before you came to university, what did you do? Please describe what you were doing.

_____

_____

_____

Section B: Please make an X in the appropriate box below

Statements	Agree	Strongly Agree	Disagree	Strongly Disagree
1. I have a cell phone.				
2. I can send an SMS.				
3. I can use a computer.				
4. The last school I attended had computers which I used.				
5. I have been trained to use a computer.				
6. I can send an e-mail.				
7. I can send an e-mail attachment.				
8. I know what e-Learning is.				
9. I think positively about e-Learning.				
10. I am not in favour of e-Learning				
11. e-Learning leads to social isolation				
12. e-Learning allows for off campus interaction between student and educators.				
13. I own a computer**.**				
14. I plan to buy a computer to follow notes online.				
15. I think that e-Learning systems are easy to master.				
16. I am able to access the Internet as needed for my studies.				
17. I am comfortable communicating with others over the internet.				
18. I am eager to communicate actively with my classmates and instructors electronically.				
19. I feel that online learning is not of the same quality as face to face classroom learning.				

20. I am committed personally to e-Learning.				

8.2   **Appendix B: Information Sheet and Consent to Participate in Research**

Title of Research: Assessing nursing students' readiness for e-Learning.

Name of investigator and contact details: Marilynne Coopasami (student) Cell No: 0844005930 Email:marilynnc@dut.ac.za

Supervisors and contact details: Dr S Knight; School of Nursing and Public Health, University of KwaZulu-Natal (031 260 4508)

Co-investigators: Mr JD Pillay and Mrs M Pete

Your consent is being sought to participate in this study. Please read the following information carefully before you decide whether or not you consent to participate.

Purpose of the research:

The purpose of this study is to establish students' readiness discover during the period of 2012/2013, just how competent, prepared and willing first year undergraduate nursing students at the Durban University of Technology are to use new technology to supplement learning in the classroom; to integrate e-Learning in their learning and to establish what factors are influencing their readiness.

Procedure: You are asked to complete in a survey questionnaire. If you have any other questions relating to this study then you can contact the

Principle investigator: Marilynne Coopasami   Contact no: 0844005930

Supervisor: Dr S Knight   contact no: 031 260 4508

Time duration of participation: The survey questionnaire should take about 20 minutes to complete

Benefits for participation: Your participation in this research will give you an opportunity to contribute to a study in the field of e-Learning. The research will not offer personal benefit but collectively it will make a contribution to knowledge development in this field of study.

Statement of confidentiality: Records will be kept confidential and will be available only to professional researchers and staff. If the results of this study are published, the data will be presented in group form and individual participants will not be identified.

Voluntary participation: Your participation is voluntary. If you believe you have been in any way forced into participation, please inform the researcher. You may also choose not to answer any question(s) that makes you uncomfortable.

Termination of participation: You may choose to withdraw from the study at any time and you will not be penalised for doing so.

Signature of Investigator _____

Date_____

---

*I have read all the information provided on this form and **consent** to participate in this study.*

_____ _____

Signature Date

_____

Please print your name

8.3 Appendix C: Permission letter

18 June 2012

F J Sithole Road

Imbali

Pietermaritzburg

3201

Private Bag X 9077

Pietermaritzburg

3200

Dear Sir/ Madam

<u>RE: Application to use Durban University of Technology Department of Nursing as a research study site.</u>

My name is Ms Marilynne Coopasami. I am a Masters of Public Health student at the School of Nursing and Public Health at the University of KwaZulu-Natal. My dissertation title is: Assessing nursing students' readiness for e-Learning. This letter serves to seek permission to use the nursing department at the Durban University of technology, Indumiso campus as the main site for data collection. As this study has not been conducted before, it would be useful to analyse the data obtained, the results of which will be of benefit to the nursing department. The participants of this study will be the first year undergraduate nursing students.

For further details you can contact me at the Department of Nursing, Indumiso campus. My contact details are as follows: my work number is 033 845 9020, my cell number is 0844005930. My e-mail address is marilynnc@dut.ac.za. Please do not hesitate to contact me for further details.

Your cooperation in this important study is highly appreciated.

Yours sincerely

_____

Marilynne Coopasami (student)

Supervisors: Dr S Knight

Co-investigators: Mr JD Pillay and Mrs M Pete

School of Nursing and Public Health, UKZN (031 260 4508)

8.4 Appendix D: Approval letter Durban University of Technology

D U R B A N
UNIVERSITY *of*
TECHNOLOGY

Research Management and Development
Durban University of Technology
Tromso Annexe, Steve Biko Campus
P.O. Box 1334, Durban 4000
Tel.: 031-3732576/7
Fax: 031-3732946
E-mail: moyos@dut.ac.za

19th June 2012

Ms M. Coopasami
c/o Department of Basic Medical Sciences
Durban University of Technology
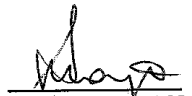
Dear Ms Coopasami

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence dated 18th June in respect of the above refers. I am pleased to inform you that the Institutional Research Committee (IRC) will grant permission to you to conduct your research at the Durban University of Technology. However, kindly note that the committee requires you to provide proof of ethical clearance prior to you commencing with your research at the DUT.

We would be grateful if a summary of your key research findings can be submitted to the IRC on completion of your studies.

Kindest regards.
Yours sincerely

PROF. S. MOYO
DIRECTOR: RESEARCH MANAGEMENT AND DEVELOPMENT (ACTING)

8.5 Appendix E: Approval Letter from Head of Nursing Department.

DURBAN UNIVERSITY of TECHNOLOGY

Department of Nursing
Durban University of Technology
PO Box 1334
Durban
4000

7 March 2013
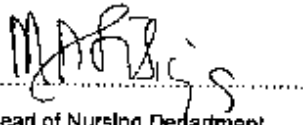
Ms M Coopasami
Department of Nursing
Durban University of Technology

Dear Ms Coopasami

PERMISSION TO CONDUCT RESEARCH IN THE DEPARTMENT OF NURSING

Your correspondence dated 15th January 2013 regarding the request for permission to conduct a research study in Nursing refers. I am pleased to inform you that you are granted permission to conduct research in the Department of Nursing (Undergraduate Nursing Programme).

The Department of Nursing wishes you the best of luck with your studies.

....
Head of Nursing Department

Dr MN Sibiya

THE HEAD OF DEPARTMENT - DEPARTMENT OF NURSING
DURBAN UNIVERSITY OF TECHNOLOGY
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8.6   Appendix F: Ethics Approval from University of KwaZulu-Natal

UNIVERSITY OF ™
KWAZULU-NATAL

INYUVESI
YAKWAZULU-NATALI

13 February 2013

Ms Marilynne Coopasami l 200003455
School of Health Science/Public Health Medicine
Howard College Campus

Protocol reference number: HSS/0052/013M
Project title: Assessing nursing students' readiness for e-Learning

Dear Ms Coopasami

Expedited Approval

I wish to inform you that your application has been granted Full Approval through an expedited review process.

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 school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Professor Steven Collings (Chair)
/px

cc Supervisor Dr Stephen Knight
cc Academic leader Professor M Mars
cc School Administrator Mrs Caroline Dhanraj

INSPIRING GREATNESS

8.7 Appendix G: List of schools attended by participants

Name of School	Quintiles	Number of Participants
Alexandra High school PMB	Other	2
Bhande high school	1	1
Bhekathina high	2	1
Bizimali school	1	3
Carter high school	Other	1
Clydesdale Secondary	2	1
Crossmoor secondary school	Other	1
Damelin	Other	1
Dumabezwe high school	3	1
Emzamweni high	3	2
Embizweni high	1	2
Fairbreeze secondary	3	1
Ferndale combined School	Other	1
Fundokuhle secondary	1	1
Glenhills secondary	Other	1
Golela high	2	4
Gowalulwazi high	Other	1
Greytown secondary	Other	1
Grosvenor girls high	Other	1
Haythorne secondary	Other	2
Heather secondary school	Other	1
Isicelosethu high	2	1
Isikhwebezi high	1	1
Isiphosemvelo high school	2	1
Khula Secondary School	2	1
Kwapata high	3	3

Khabazela high school	Other	1
Leshman secondary	2	1
Lugebhuta high	2	1
Lobethal school	Other	1
Mahlohloko secondary	1	1
Matomela high school	2	2
Makhedama High school	1	1
Malambule High School	2	1
Manzana high	1	1
Mariathal combined	2	1
Masibumbane high	Other	1
Mathubesizwe FET	Other	1
Mazwendoda high school	2	2
Mconjwanahigh	Other	1
Mhlakothi high	1	1
Molepha high school	Other	1
Mpophomeni secondary	1	1
Mpolweni high	3	1
Mlsultan Secondary	Other	1
Mvuthulka secondary	1	1
Ncakini secondary school (mpumpalanga)	2	1
Northbury secondary	Other	1
Nsikayethu comprehension school	1	1
Nani high school	2	1
Nciya high	1	1
Ngwayibanjwa secondary school	1	1
Ngono high	1	2

Nkonka high	3	1
Nomaswazi high school	Other	1
Ntandoyesizwe High	2	1
Ntabasuka secondary school	1	1
Pholela high	3	3
Pmb girls high	Other	3
Port Shepstone high	Other	1
Qhakaza high school	3	1
Raisethorpe secondary school	Other	1
Roseville secondary	Other	2
Rydal Park	Other	1
Sbongumbomvu combined school	Other	1
Seatides combined school	Other	1
Sea Cow Lake secondary School	Other	1
Silver Height secondary	Other	1
Sivananda tech high	Other	1
Sigqamise high school	Other	2
St John's College	Other	1
St Josephs secondary school	3	1
Thamsanqa high	1	1
Tholokuhle secondary school	1	1
Thekelisvlwazi	1	1
Tinara high	3	1
Umlazi commercial	other	1
Umlazi comtech high	Other	1
Umthawalume high	Other	
Zama high	2	1

| Zamazulu high school | Other | 1 |

8.8 Appendix H: Readiness Scores.

Pre-questionnaire and Post-questionnaire scores

RESULTS DATA 2072013MC.xlsx

8.9   **Appendix I: Adapted questionnaire for future research**

B. Characteristics of Student

Note: Please use a tick in the appropriate box.

1) .Please provide information on your current status

	Yes	No
A. New Student (First year at D.U.T)		
B. Repeat Student(Anatomy and Physiology subject)		
I. Student that came from another faculty		
II. Student that transferred from another university		

2) Gender

Male	
Female	

3. Current Age (in years)

4. The type of school that you went to prior to university entrance.

Name of school		
Type of school	Yes	No
Urban		
Rural		
Model C		
Private		
Home-schooled		

5. Did the school you attend have computers? Yes/No

6. Did the school you attend have computer classes? Yes/No

7. Did you enter DUT directly after obtaining your Senior Certificate /matric? Yes/No

8. If you did not attend school the year before you came to university, what did you do? :

Options	Yes	No
Working		
Studying		
Was at home		

Section B: Please make an X in the appropriate box below

Statements	Agree	Strongly Agree	Disagree	Strongly Disagree
1. I have a cell phone.				
2. I can send an SMS.				
3. I can use a computer.				
4. The last school I attended had computers which I used.				
5. I have been trained to use a computer.				
6. I can send an e-mail.				
7. I can send an e-mail attachment.				
8. I know what e-Learning is.				
9. I think positively about e-Learning.				
10. I am not in favour of e-Learning				
11. e-Learning leads to social isolation (it separates you from your colleagues)				
12. e-Learning allows for off campus interaction between student and educators.				
13. I own a computer**.**				
14. I plan to buy a computer to follow notes online.(to assist me with my studies)				
15. I think that e-Learning systems are easy to master.				
16. I am able to access the Internet as needed for my studies.				
17. I am comfortable communicating with others over the internet.				
18. I am eager to communicate actively with my classmates and instructors electronically.				
19. I prefer online learning to classroom learning				

20. I am committed personally to e-Learning.				