Faculty of Health Sciences
School of Health Care Sciences
Department of Nursing

TECHNOLOGICAL MEANS IN TEACHING AND LEARNING OF UNDERGRADUATE STUDENTS IN THE 21ST CENTURY AT A NURSING EDUCATION INSTITUTION IN TSHWANE

by

Phonia Nambewe Bopape
Student number: 95288270

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University of Pretoria

Supervisor: Prof. S.S. Moloko-Phiri

Co-supervisor: Dr N. Mshunqane

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DECLARATION

Student number: 95288270

I Phonia Nambewe Bopape declare that the thesis "**Technological means in teaching and learning of undergraduate students in the 21st century at a nursing education institution in Tshwane"** is my original work and that it has not been submitted either in whole or in part, for the purpose of acquiring a degree at this or any other university. All sources that have been used and quoted have been properly acknowledged and referenced by means of a complete list of references in accordance with departmental requirements.

PHONIA NAMBEWE BOPAPE **DATE:**

DEDICATION

This thesis is dedicated to my family, who have inspired and encouraged me in various ways.

My husband, Makobe Jonas Bopape, my children, my two sons, Seleta Refentse and Lesedi Mmupi, my only daughter, Leago Morongwa Bopape, for always believing in me and encouraging me when I least believed in myself. May God bless you.

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ABSTRACT

Background: Twenty-first century undergraduate students are tomorrow's leaders in the nursing profession and therefore their teaching and learning should be a priority for the nurse educators. Rapid technological changes due to globalisation, socioeconomic and political factors are challenging the nursing profession to refine nurse education, training and practice to quickly adapt and cope with contemporary health needs.

In some nursing education institutions, the researcher observed that the nurse educators were still solely using traditional methods of teaching such as lectures, chalkboards and transparencies. In addition, these nurse educators appeared to be the only ones with knowledge and information, while students were passive receivers. In order to effectively teach undergraduate students, nurse educators need to modify traditional teaching methods to blend with 21st century teaching and learning.

Research question: The question that guided the study was: What are technological means in 21st century undergraduate students' teaching and learning at a nursing education institution in Tshwane?

The study aimed to determine technological means in enhancing teaching and learning of undergraduate students in the 21st century at a nursing education institution in Tshwane.

Objectives: The study sought to determine technological means in 21st century undergraduate students' teaching and learning at a nursing education institution in Tshwane.

Methods: A quantitative, non-experimental descriptive design was used to determine technological means in 21st century undergraduate students' teaching and learning at a nursing education institution in Tshwane. A survey was used to collect data from a sample of the population of n=800 students using a structured questionnaire.

Data analysis: Data were analysed using SAS version 9.4 statistical package.

Ethical considerations and quality control were maintained throughout the study.

Results: The projected outputs of the study were that technological means could be informed from the recommendations of the study so that nurse educator's teaching strategies used can be reviewed and blended teaching strategies implemented, to ensure that teaching and learning of undergraduate nursing students is in line with 21st century skills.

The results of the study indicated that more than 60% of respondents across all levels used a technological device in their daily learning to conduct research related to content being taught in class.

More than 80% of respondents from all levels did not prefer the literature search method, which is a method that encourages active participation and critical thinking, although almost all respondents confirmed ownership and use of a technological device in their daily learning as a social norm.

Key words: teaching, learning, undergraduate student, 21st century, technological, conducive learning, facilitation of learning, nurse educator

TABLE OF CONTENTS

LIST OF ANNEXURES

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

NEI = NURSING EDUCATION INSTITUTION

USA = UNITED STATES OF AMERICA

CHAPTER 1
ORIENTATION OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Globally, undergraduate nursing students at present are mostly students who belong to “Generation Y” or the millennial generation (Lombard 2012:37-40). These students have been brought up and socialised in the digital age, where smartphones, iPods and tablets, among others, play a vital role in their daily lives more than ever before and are mainly used for social networking and communication (Lombard 2012:37-40). In a study conducted in North Carolina, United States of America (USA), Johanson (2012:173) identified that 21st century students are enthusiastic and self-confident, work in groups, prefer multi-tasking, and find it difficult to focus on a single activity at a particular time. These students work well in collaborative internet searches for information rather than solely using textbooks (McCurry and Martins 2010:277; Bucuta 2015:42). Pardue and Morgan (2008:74) describe Generation Y students as students who prefer the use of technology, which should be integrated into their teaching and learning. In addition, the authors report that these students are progressive thinkers who process information quickly; however, they get bored easily due to their short attention span (Popescul and Georgescu 2015:77).

Following globalisation, a shift has emerged in how students learn, and the increasing functionality of technology is raising the bar in teaching and learning, searching, retrieving and critically evaluating information from a range of sources (Chelliah and Clarke 2011:276; Lombard 2012:37-40). A study conducted in South Africa by Educause Centre for Analysis and Research (2014, cited in Brown and Pallitt 2015:1-2) reported a lack of growth in lecturers embracing personal mobile devices use in classroom, though students brought their smartphones to class. Makondo (2012:108) asserts that, in Zimbabwe and South Africa, the use of e-learning and many technologically oriented methods remain a challenge among educators in higher educational institutions.

The globalisation shift that has emerged implies that nurse educators are faced with increasing demands to provide Generation Y students with current information to meet the demands of the 21st century. The nurse educators need to acknowledge and encourage the multi-tasking element of Generation Y students in order to advance 21st century teaching and learning (Johnson and Romanello 2005:214; Darling-Hammond 2006:300; Lai and Hong 2015:725). Traditionally, nursing education has emphasised educator-centred approaches rather than student-centred approaches (Abdelaziz, Kamel, Karam and Abdelrahman 2011:51). In order to improve teaching and learning, nurse educators are expected to

quickly adapt to current changes in knowledge expansion and technological innovations to meet the needs of the 21st century students (Tedla 2012:199; Mathipa and Mukhari 2014:1213).

Despite global technological changes, 64% of teachers reported that they never used computers in classroom teaching in a study conducted at two educational institutions in South Africa, while only a small percentage reported occasional use (Makgatho 2012:109). According to Tedla (2012:199-200) and Makgatho (2012:108), the availability of technological infrastructure results in the successful utilisation of technology in teaching and learning, while unrealistic policies regarding the use and integration of technological tools in classroom teaching and learning and nurse educator incompetence were identified as some of the delaying factors of using technology in teaching.

1.2 PROBLEM STATEMENT

Twenty-first century undergraduate nursing students enter nursing education institutions (NEIs) with extensive technological skills (Broussard 2012:3). Additionally, these students own devices including laptops, tablets, iPods and iPhone, which are sometimes Wi-Fi enabled (Broussard 2012:3). Technological diffusion resulting from globalisation and the explosion of knowledge has put various NEIs under pressure to incorporate and implement the use of technology in teaching and learning for flexible learning purposes instead of relying on textbooks as the only information source (Mathipa and Mukhari 2014:1213; Islam, Beer and Slack 2015:103). Use of information and communication technology has suddenly become an important aspect of training future nurses, and has been regarded as promoting teaching and learning in nursing education practice (Kala, Isaramalai and Pohthong 2010:61; Forneris and Tiffany 2017:1).

During the researcher's undertaking of practica lectures at various NEIs while still a nursing education student, the researcher observed that, at some NEIs in Gauteng, the nurse educators were still using solely traditional methods of teaching undergraduate students in the 21st century such as the lecture method. In addition, they were using traditional teaching media like chalkboards and transparencies, without integrating available technological means to enhance student engagement and connect with their technical skills. The educators appeared to be the only ones with knowledge and information, while students were passive receivers. In those NEIs, the researcher also observed that provision was made by the institutions to supply nurse educators with computers to use for lesson preparation, however they were not being utilized.

Generation Y students are technologically oriented, often easily bored and challenging to handle, and they need to be actively engaged in their learning to develop critical thinking skills (Makgatho 2012:109). Surprisingly, students brought their mobile phones and tablets, which were Wi-Fi enabled, along to class

but were not encouraged to use them in searching for information online, as this was regarded as a "distraction" by the nurse educators (Hugo and Fakude 2016:3).

Today's nurse educators feel challenged, as traditional teaching methods they previously used are no longer effective on the 21st century students who prefer collaborative learning and active participation, which are student-centred (Ecklebury-Hunt and Tucciarone 2011:458; Henry and Gibson-Howell 2011:230; Syed 2015:6-7). Based on these assertions, the researcher intended to determine technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane.

1.3 RESEARCH QUESTIONS, AIM AND OBJECTIVES

The research question that this study seeks to answer is: What are the technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane?

The research aim and objective are presented below.

1.3.1 Research aim

- To determine technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane.

1.3.2 Objective

- To determine technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane.

1.4 DEFINITION OF KEY WORDS

- **Teaching** refers to "teacher conduct that has the conscious intention and potential to facilitate learning in another through dissemination of knowledge" (Billings and Halstead 2016:9). For the purpose of this study, teaching refers to instructional activities that a nurse educator undertakes to impart knowledge to 21st century undergraduate students at an NEI in Tshwane.
- **Learning** is "an active process of constructing meaning and transforming understanding in interaction with the environment" (Bruce, Klopper and Mellish 2011:122). In this study, learning refers to skills and knowledge acquired by an undergraduate student nurse enrolled in the four-year programme, Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425).

- **Undergraduate student** refers to a student nurse undergoing a four-year nurse training in Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425) leading to registration with the South African Nursing Council as a general, psychiatric or community nurse or midwife, according to the South African Nursing Council (1985) Regulation R. 425 of 1985. In this study, an undergraduate nursing student refers to a student who is enrolled in the four-year Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425) from first to fourth year.
- **Twenty-first century** refers to "the current century of the Anno Domini era or Common Era, in accordance with the Gregorian calendar. It began on January 1, 2001 and will end on December 31, 2100" (Wikipedia 2018). Twenty-first century teaching refers to a teaching and learning environment where collaborative learning, critical and creative thinking, teamwork, problem-solving and proficiency in the use of technology are encouraged (Fisher and Frey 2015:1). In this study, it refers to using technological means during the teaching of undergraduate students in Tshwane.
- **Generation Y** is the generation born between 1977 and 2003, a period which is referred to as the information age. Members of this generation were born into a society featuring international interdependence and global engagements, and have digital capabilities (Benckendorff, Moscardo and Pendergast 2010:9; Devaney 2015:12-13). In this study, it refers to undergraduate nursing students undertaking the four-year Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425) at an NEI in Tshwane.
- **Technological means** refer to the use of materials, tools, techniques and a form of knowledge to make learning more productive (Januszewski and Molenda 2010:9). In this study, technological means refer to interaction with technological mediums, techniques and tools to enhance the teaching and learning of 21st century students.
- **Means** refer to a method or way of doing something. In the context of this study, means refer to technological method or digital method of teaching and learning that may be used in 21st century teaching and learning.
- **Conducive learning environment** refers to an environment that supports and promotes learning, where there is a climate of trust and respect, and students are directed towards achieving their learning outcomes (Hugo and Fakude 2016:141).
- **Facilitation of learning** refers to the nurse educator encouraging and supporting students to take a lead in learning activities, providing a forum for students to explore knowledge individually or with fellow students (Hugo and Fakude 2016:141).
- **Nurse educator** refers to a professional nurse who has an added qualification of nursing education either at diploma or degree level and is registered with the SANC as a nurse educator,

who has a role of facilitating development of students' critical thinking skills (Bruce and Klopper 2017:89). In this study, the term "nurse educator" is used interchangeably with "lecturer".

1.5 THEORETICAL FRAMEWORK

The humanistic approach to learning guided the study, based on Carl Roger's student-centred approach to learning. Humanism is a learning theory that believes in the innate ability of students to learn, self-direct, self-actualise and create an environment in which they have freedom to learn (Heim 2012:291). Carl Rogers contrasted between the traditional approach and the student-centred approach to learning (West and Saunders 2006:720; Tangney 2014:267-268). The traditional approach believes that the nurse educator is an expert who conveys her knowledge to students. The humanistic approach holds the view that the nurse educator acts as a facilitator of student learning (Heim 2012:293).

In this study, facilitation of learning by the nurse educator using technological means in classroom teaching as well as encouraging students to explore, learn independently and conduct research using their own technological means like smartphones was adopted as one of the key elements in Carl Roger's student-centred approach. The use of technology is regarded as a modern teaching and learning strategy that identifies the aims, goals, purpose and passion of the student, unlike the traditional approach (West and Saunders 2006:720; Rowley, Fook and Glazzard 2018:35-36). When a genuine student-centred approach to teaching and learning is present, and students are permitted to follow their innate curiosity using technology, effective learning is promoted as they will be actively involved in their learning (West and Saunders 2006:721; Clarke 2010:16; Tangney 2014:267). The researcher therefore applied Carl Roger's student-centred approach to determine technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane.

1.6 DELIMITATIONS AND ASSUMPTIONS

1.6.1 Delimitations

Delimitations refer to "those characteristics that are under the researcher's control that limit the scope and define boundaries of the proposed study" (Simon 2011:3). For the purpose of this study, undergraduate nursing students, from level 2 to level 4, who were enrolled for the four-year Diploma in Nursing (General, Psychiatric and Community) and Midwifery R.425 at an NEI in Tshwane were asked to take part in the study.

1.6.2 Assumptions

Assumptions are statements embedded in people's thinking and behaviour. They are considered to be true without scientific proof and they influence the implementation of the logic and research process (Burns and Grove 2009:40). This study was guided by a positivist paradigm approach. A positivist paradigm is a "systematic way of conducting research which emphasises the importance of observable facts" (Botma, Greeff, Mulaudzi and Wright 2010:42). In order to determine technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane, standardised procedures were followed, and reality was approached in a neutral, detached and systematic way, free from bias, so that generalisations could be made from the collected data (Botma, et al 2010:42). The paradigm's ontological, epistemological and methodological assumptions are discussed below.

1.6.2.1 Ontological assumptions

Ontology is the nature of reality and is concerned with how the world is viewed (Botma, et al 2010:40; Polit and Beck 2012:11). In addition, ontology is concerned with the researcher's ideas about the nature and characteristics of what is being studied; all decisions are influenced by the research question (Botma, et al 2010:40). In this study, the ontological assumptions were that teaching and learning are interrelated, and that the resultant change in the students' behaviour was due to effective teaching methods being applied by the nurse educators.

1.6.2.2 Epistemological assumptions

Jooste (2010:272) defines epistemology as "knowledge that is well substantiated as opposed to opinion". In addition, epistemology is about developing valid and true statements about phenomena under study. The phenomenon under study is technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane. For the purpose of this study, knowledge related to the stated phenomenon was generated by using a structured questionnaire. Data were analysed and described using Carl Rogers' theory of student-centredness.

1.6.2.3 Methodological assumptions

Methodological assumptions are concerned with how knowledge is obtained and how the research aim is achieved (Jooste 2010:272). For the purpose of the study, methodological assumptions guided the researcher in obtaining numeric values that could be statistically analysed, to determine and assess technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane.

1.7 RESEARCH DESIGN AND METHOD

A research design is a blueprint for conducting the study, and it maximises control over factors that could interfere with the desired outcome (Burns and Grove 2011:49; Hofstee 2011:108). A quantitative, non-experimental descriptive design was used to determine the technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane. A non-experimental descriptive design was utilised in this study as empirical evidence in determining technological means in undergraduate students' teaching and learning was preferred to personal beliefs (Burns and Grove 2009:218-219).

A multistage sampling method was used for the study. The study setting was a specific NEI in Tshwane where nursing students were enrolled for the Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425). The researcher conducted a survey in the form of a self-administered structured questionnaire to collect data from the respondents in order to determine the technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane. A statistical program, SAS version 9.4, was used to analyse all the data. The chi-square test (X^2) for equal proportion was used to analyse descriptive information. See Chapter 3 for the detailed research method.

1.8 IMPORTANCE AND BENEFITS OF THE STUDY

Nursing education: The findings from the study may inform NEIs to incorporate technology in undergraduate nursing students' teaching and learning. The findings of the study on preferred teaching methods may also assist nurse educators to adopt teaching methods that can accommodate the various learning styles of 21st century students. Self-directed learning could be improved as institutions adopt a supportive environment towards technology-mediated learning. The pattern of learning may be improved from instructional to more collaborative approaches between educators and students and among students themselves. Nurse educators could start to focus on facilitation of learning, as they are no longer viewed as the only source of all knowledge but as facilitators of student learning.

Nursing practice: The study may also benefit patients, because student-centred learning where the students are actively involved in searching for information would be practised, thus increasing patients' outcomes. Care standards in rural clinical facilities may be improved in terms of record-keeping, waiting times and access to health care, due to improved management systems learned during technologically-mediated nurse education and training. It is predicted that communication using technological means may be made easier and critical decision-making may be enhanced, which can save patients' lives. Autonomous leadership styles may emerge from the students as a result of this study, as students would

learn to take the lead in their learning and not to solely rely on the nurse educator's coaching all the time.

1.9 ETHICAL AND LEGAL CONSIDERATIONS

Pera and Van Tonder (2011:5-6) define ethics as standards of practice or moral values in human conduct among specific groups or individuals. According to Bless, Higson-Smith and Sithole (2013:28), research ethics refers to principles that oversee the relationship between the researcher and the participants in the study, with regard to how the respondents should be treated before, during and after the research. The ethical principles according to the Belmont Report of 1979 (cited in LoBiondo-Wood and Haber 2014:256-260) were maintained throughout the study, namely, justice, beneficence, respect for human dignity and informed consent.

1.9.1 Permission to conduct the study

The Review Board of the institution expects the researcher to submit research proposal for assessment so as to determine whether the respondents' welfare and rights will be protected from harm in the planned study (LoBiondo-Wood and Haber 2014:263-264). Accordingly, the research proposal was submitted to the University of Pretoria Ethics Committee for permission to conduct the study, which was granted. Written permission was granted by the Gauteng Department of Health, Tshwane Research Committee, and permission was obtained from the principal of the specific NEI in Tshwane where the study was conducted. Letters of approval from the applicable institutions are attached – see Annexures D, E and F.

The research purpose and objectives of the study were further explained to the respondents in the information leaflet which was given to the respondents along with the consent form.

1.9.2 Justice

The principle of justice holds that each person should be treated fairly and should receive what he or she is due (Burns and Grove 2009:198). For the purpose of the study, participation was on voluntary basis and random sampling was used so that all respondents received fair treatment. Any respondent who decided not to take part in the study was respected. The researcher provided her contact details and those of the ethics committee on every questionnaire distributed so that she could be contacted for any queries.

1.9.3 Beneficence

Beneficence means to not only refrain from harm, but to do well in ensuring that respondents' safety and wellbeing are secured (Botma, et al 2010:20; Bless, et al 2013:29).

1.9.3.1 Right to freedom from harm and discomfort

The researcher is obliged to avoid and minimise harm and discomfort to respondents. In the case of anticipated risks of harm to respondents with continuation of the study, the researcher is obliged to terminate the study to protect the respondents (Polit and Beck 2012:83). In this study, there were no anticipated risks of harm to respondents, personal information would not be revealed and all information received was treated in confidence. Respondents were assured of their right to terminate participation at any time, should they wish to do so.

1.9.3.2 Right to protection from exploitation

Respondents need reassurance that information shared will not be used against them and that privacy will be maintained (Polit and Beck 2012:83). In this study, respondents were assigned a specific number in order to protect their identity. Completed questionnaires were kept under lock and key in a safe place at the institution where the researcher was studying. Data collected were solely used for the purposes of the study and a declaration was signed by the researcher with regard to data safekeeping.

1.9.3.3 Respect for human dignity

People have the ability of self-determination, to direct their own destiny, and should thus be treated as autonomous with freedom to conduct their lives as they choose without any external control (Burns and Grove 2009:189). In this study, self-determination was achieved by allowing respondents the right to decide voluntarily on participation in the study without any penalty.

1.9.4 Informed consent

Informed consent refers to respondents having adequate information about the research, understanding what is expected of them and having the right to decide not to participate in the study without any penalty (Polit and Beck 2012:157). In this study, verbal and written consent was sought. Respondents were asked to sign the informed consent form and were assured that withdrawal from the study would not incur any penalties. A first draft of the informed consent form was attached to the draft proposal.

1.10 LAYOUT OF THE STUDY

The layout followed in the study is shown in Table 1.1 below.

Table 1.1: Layout of the study

Chapter	Description
Chapter 1: Overview of the study	The chapter provides the reader with the background, research problem, aim and objective of the study, an introduction to the research design and methodology, and a discussion about ethical considerations adhered to in the study.
Chapter 2: Literature review	In this chapter, the literature related to technological means in 21st century undergraduate students' teaching and learning, teaching and learning in the classroom, teaching strategies, and theoretical perspective of Carl Rogers' theory of student-centredness are discussed.
Chapter 3: Research methodology	This chapter provides a detailed discussion on the research methodology and design followed in the study.
Chapter 4: Presentation and discussion of results	This chapter outlines the presentation and interpretation of results in the form of tables and graphs.
Chapter 5: Conclusions, implications, limitations and recommendations	This chapter focuses on the summary of the study findings, as well as limitations of the study and recommendations arising from the study.

1.11 CONCLUSION

An overview of the study background, problem statement, aim and objective, research questions, research methods and design, and ethical considerations was provided in this chapter. The literature review is presented in Chapter 2.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter provided an overview of the study. This chapter presents the literature review related to technological means in undergraduate students' teaching and learning at a specific NEI in Tshwane. According to Hart (2018:4), a literature review means searching, reading and analysing all written resources relevant to the topic being studied and presenting the information in a rational order. A literature review on the topic "technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane" was conducted using the following search engines: Google Scholar, WorldCat discovery database, Scopus, South African journal database or SA e-Publications, international databases (EBSCOhost and ScienceDirect), the University of Pretoria repository, ProQuest and theses and dissertations from University of Johannesburg, for previous theses related to the topic. The following keywords were used: technological, teaching, learning, undergraduate students. Approximately 150 articles were downloaded, and from these, 62 relevant articles were read.

The purpose of this literature review is to provide a comprehensive background in determining technological means in teaching and learning of undergraduate students in line with 21st century teaching and learning. The literature review aims at identifying gaps in literature in order to make recommendations and suggest ways to enhance teaching and promote active learning of students. The literature review focuses on:

1. Technological means in 21st century undergraduate students' teaching and learning at a specific NEI in Tshwane.
2. Teaching and learning strategies that can be utilised in undergraduate students' teaching and learning at a specific NEI in Tshwane.

2.2 TECHNOLOGICAL MEANS THAT INFLUENCE THE TEACHING AND LEARNING OF UNDERGRADUATE NURSING STUDENTS

Nursing education faces challenges and is in a transitional period in preparing 21st century nursing students to live and work in an information-, technology- and communication-driven world of work characterised by constant innovation (Furst 2011:105). Nurse educators are therefore obliged to make a paradigm shift in response to this transition. They need to shift from traditional teaching methods to more innovative, modern technology-based teaching methods in line with the 21st century (Hugo and

Fakude 2016:25). Additionally, nurse educators need to provide learning experiences that support millennial students' optimal learning and to prepare them to face a technologically advanced working environment.

2.2.1 Access to online information

The present situation in institutions of higher learning demands that nurse educators create learning experiences that actively and meaningfully involve students in their learning instead of requiring them to passively absorb information (Bassendowski and Petrucka 2013:665). Gupta and Koo (2010:268) also assert that online resources and mobile technological means, supported by a virtual learning environment, exert pressure on traditional face-to-face teaching. The current generation of undergraduate students are more technologically inclined and therefore need to be stirred up by a teaching environment that is similar to their expectations (Hugo and Fakude 2016:26).

Social media platforms, including Facebook, Twitter and WhatsApp, are means of social interaction that provide platforms for information sharing, communication and collaborative learning. They allow students to work in groups, produce online reflective diaries and obtain information and learning resources (Maboe and De Villiers 2011:94). Students can access information and educational materials from their smartphones, tablets and laptops using available educational applications and learning environments that are supported by their NEIs. This information can be accessed during the students' spare time, outside the classroom or during classroom teaching (Reese 2015:580). In addition, these types of technologies have changed the focus of learning from rote learning to accessing, interpreting and applying relevant information to promote critical thinking (Spallek and von Bergmann 2014:1580). The advanced platforms on social media create easy networking among students themselves and between students and the nurse educator (Reese 2015:581). Mwanza-Simwami (2011:75) affirms this notion of easy networking in a study on social networks, where students indicated that social networks play a role in shaping and creating learning opportunities through collaboration and interaction. Social media was the preferred method of networking and learning, and a source of moral and academic support among students (Mwanza-Simwami 2011:75). Furthermore, the intentional integration of social media into teaching and learning during and outside class can be a success if a structure relating to the use is put in place so that student learning is not negatively impacted.

A study conducted in the United Kingdom, Kenya and Saudi Arabia showed that students' use of the internet improved their academic self-confidence, academic self-reliance and student–lecturer connectedness. Most importantly, students' use of the internet decreased the gap in the student–lecturer expert relationship which promotes rote learning (Alshahrani, Ahmed and Ward 2017:87). The lecturer–student relationship is considered key to learning; however, in the 21st century, it is rapidly transforming

due to the popularity of and easy access to online learning resources (Tomei 2011:2; Alshahrani, et al 2017:87). In addition, students have at their disposal, online resources such as open education resources, commercial e-learning products and Google Scholar, all of which they can easily access inside or outside the classroom by using their smartphones, tablets, or laptop or desktop computers using Wi-Fi connections (Alshahrani, et al 2017:90). Online resources, as indicated by Carl Rogers, assist students through a student-centred approach which encourages students to find alternative ways to solve problems in the classroom and boosts their academic self-confidence (Alshahrani, et al 2017:91-101).

2.2.2 Digital distraction during classroom teaching

Contrary to the fact that technological means encourage students to be actively involved in their learning, Nath, Chen and Muyingi (2015:1-2) discuss the possibility that these technologies may promote classroom digital distraction and cognitive overload in students who are internet addicts and students with different learning styles. Further, they elaborate that students often use laptops, smartphones, tablets and other digital technological means during classroom lectures for irrelevant activities, such as playing games, texting, sending personal emails, interacting on social networks and even shopping online. This could be a reason for the reluctant integration of technological means in teaching and learning by nurse educators and the resultant restrictive use of such means in classroom teaching (Nath, et al 2015:2). In a study conducted in Texas on the use of social media in nursing education, Peck (2014:165) recommended that institutions should formulate guidelines and policies governing social media use, to enable open usage and benefits by both students and nurse educators.

2.2.3 Current trends in South African higher education institutions

In South African higher education institutions, current trends in teaching and learning are focused on incorporating technology in teaching and learning, integrated learning through “blended learning”, and writing for academic purposes (Singh 2015:5). These institutions have undergone changes in recent years, due to political, social and economic contexts in higher education and the increasing use of social networking that has taken the world by storm. For various reasons, these institutions have been slow in accepting and making full use of the available information technologies (Chawinga 2017:6). In some higher education institutions in South Africa, mobile learning is often discouraged in classrooms as students are requested to switch off their mobile devices during lectures (Furst 2011:105; Singh 2012:6). In addition, many educators cannot utilise the advantage of using technology in their classroom teaching of millennial students due to rigid management policies that require amendment (Tedla 2012:199-200). In a study by Willemse, Jooste and Bozalek (2014:194) on the perceptions of students and educators on the potential use of mobile devices in an undergraduate nursing module, 79 out of 84 students

responded that mobile devices could improve the integration of theory and practice; however, no guidelines were provided on their use in classroom teaching by nurse educators. Furthermore, learning management systems such as Blackboard are most commonly used by some higher education institutions and students are benefitting from this platform, which can be accessed through the use of smartphones anywhere, anytime (Willemse, et al 2014:194).

Despite all the technological advances in using mobile technological devices in teaching and learning, the interaction between nurse educators and students cannot be ignored (Singh 2012:5). In a study conducted in Gauteng province, South Africa, among second- and third-year student nurses on the use of computer-assisted instruction in nursing education, most students responded that they preferred technologically assisted teaching and learning methods. However, access to computers at the institution was limited to the media centre only, and no Wi-Fi was readily accessible anywhere at the institution concerned. This resulted in it being difficult for students to keep up to date with technological developments (Maboe and De Villiers 2011:97-98).

2.2.4 Hybrid learning

Hybrid learning has been introduced in some institutions of higher learning so as to promote the use of technology in teaching and learning (Manwaring, Larsen, Graham, Henrie and Halverson 2017:21). Hybrid learning or blended learning refers to courses that have a combination of both face-to-face classroom teaching and online learning (Hiralaal 2012:316). In addition, hybrid learning involves a shift from traditional style of teaching to a student-centred approach, as 21st century students are more technologically advanced and need to be involved in their own learning. Hybrid learning is now being introduced in some institutions of higher learning that seek a compromise between conventional classroom lecture and pure e-learning and teaching (Henrich and Sieber 2010:89). The introduction of hybrid learning has many implications in areas where high-speed access to the internet is not always reliable or available to both staff and students. In South Africa, internet access is costly as compared to other countries, so the use of technological means such as smartphones and iPads seems to be affordable only where access to free Wi-Fi is possible, as not every student is privileged to have internet access around the clock (Singh 2015:8). Although the use of mobile technology is commonly used in hybrid learning, the disadvantage is that students lack writing skills and language expression (Singh 2015:8); thus, students fail to write academically.

2.3 TEACHING AND LEARNING IN THE CLASSROOM

2.3.1 Learning style of students

Students use different learning styles in gathering and processing information, which are normally acquired through the students' socialisation as they develop (Sywelem, Al-Harbi, Fathema and Witte 2012:10). A learning style is defined as students' preferred way of learning, which will determine how they perceive, process and understand knowledge (Bruce and Klopper 2017:122). The learning style influences both students' academic performance and their learning. No particular learning style is most common among students, so nurse educators should have a broader understanding of various styles to accommodate all students (Islam, et al 2015:104). Diverse learning styles often create challenges to nurse educators who are expected to meet the learning needs of all students in the classroom (Appleman 2016:50). In addition, an understanding of learning styles requires critical consideration during curriculum design. NEIs should provide resources and training for nurse educators to meet this challenge (Islam, et al 2015:104). Various theories of learning styles have been developed, such as Kolb's learning style inventory and Honey and Mumford's learning cycles (Bruce, et al 2011:126). In this study, some of the learning styles discussed are derived from the above theorists. Students may present with one or more of the learning styles discussed below.

2.3.1.1 Divergers

According to Bruce, et al (2011:127) divergers are students who are imaginative and would always want to know why things are done a certain way; they have innovative capability and enjoy exploring new ideas, brainstorming and generating new ideas about what they are learning. Hugo and Fakude (2016:25-26) concur that these students find traditional teaching methods boring, uninspiring and uninteresting. They prefer group-based brainstorming discussions as they learn from direct experience. Furst (2011:8-9) states that, when students take an active role in their own learning, for example in group discussions, the nurse educator's role is to be a facilitator and to guide students to acquire the necessary knowledge, skills, values and attitudes.

2.3.1.2 Assimilators

These students are reflective observers who prefer abstract concepts. They are interested in knowing the practicality of ideas and how they can integrate what they have observed into theoretical models, based on their analysis of the observations (Balakrishnan and Lay 2015:10). The nurse educator plays a role of providing the expertise knowledge in answering the "what" aspect of their observations (Bruce and Klopper 2017:128). These students have an aptitude for theoretical work and problem-solving, and

they require time to reflect and think on ways of tackling a given task. They are independent students who prefer to work on their own and thrive in solitary learning environments. Social media tools such as Facebook, Twitter and WhatsApp, where there is no face-face interaction, may be preferred methods of social interaction for these students in order to collaborate and communicate with their colleagues and with the nurse educator (Balakrishnan and Lay 2015:14).

2.3.1.3 Convergers

Convergers are active experimenters who prefer working on their own and seeing the finished task. They are pragmatic, and they learn by doing and applying what they have learned. Technologically enhanced learning is the most preferred method for these students as they display a high level of problem-solving, and enjoy problem-solving in experiments, for example in the laboratory, to doing research as they prefer processing information through action (ALQahtani and Al-Gahtani 2014:927).

2.3.1.4 Accommodators

Accommodators are also referred to as active experimenters as they have a strong preference for doing rather than thinking, which results in these students preferring practical skills to lectures (Bruce, et al 2011:128). These students learn better independently than with others, and they may benefit from the use of social media such as blogging to collaborate with their colleagues and the nurse educator (Balakrishnan and Lay 2015:15). Furthermore, the use of blog posts may improve students' reflective skills.

2.3.2 Language and cultural barriers

Culture acts as an important agent in influencing information processing as well as learning, and has a role in deciding a student's preference for abstract conceptualising versus real experience (Sywelem, et al 2012:15). The type of technological means that the student utilises may have personal meaning to the student, yet may be contextually sensitive to the beliefs, cultural values and norms of the society in which that technology is used (Mwanza-Simwami 2011:76).

Language is perceived as an integral component of teaching and learning; however, it can be one of the hindering factors if not well developed, especially among African students who have English as a second language (Ndawo 2013:56). According to Bruce, et al (2011:139), students who have English as a second language often experience challenges with understanding complex concepts, critical thinking and analysis. Undergraduate nursing students come from different cultural backgrounds and speak different languages, as South Africa has 11 official languages, but English is currently the preferred medium of instruction at most NEIs.

Research conducted at a specific NEI in Gauteng concluded that the language barrier was one of the causes of a high failure rate, and occasional translation by the nurse educator to enhance understanding took most of the time allocated for the lecture, leaving some content not covered (Ndawo 2013:57). Technological means in teaching, for example e-learning and discussion boards, may assist such students to clarify certain information and overcome their fear of asking questions because they may not articulate the question accurately (Bruce, et al 2011:139). Nurse educators have a responsibility to teach undergraduate nursing students about cultural tolerance, and respect for people's individuality and differences.

2.3.3 Large student numbers in a classroom

According to Sikarwar (2015:112), large classes are common in traditional teaching. The challenge for students in such classes is passive learning, while for the nurse educator it is the inability to identify the learning difficulties of each individual student and to actively engage students. In a study conducted at a specific NEI in Gauteng, large student numbers in a classroom were cited as one of the challenges faced by nurse educators in the teaching and learning of students, as was evident in the high failure rate of students (Ndawo 2013:81). Because of the large numbers, the nurse educators were often not able to identify the learning challenges of students who were struggling. Kirsten and Kunz (2015:4) concur that large student numbers in an auditorium with rigid seating arrangements pose a challenge, as seats cannot be rearranged. A lecture method is commonly the preferred method of teaching in large class environments. However, this is a less preferred method by 21st century undergraduate nursing students, as they are known to get bored very easily, are confident in the use of technology and prefer active engagement in the lecture (Lombard 2012:37-40).The use of technological means such as YouTube videos, gaming and role-play could engage most of the students as active participation and engagement would be promoted and therefore stimulate enthusiasm for learning (Rankin and Brown 2016:97).

2.3.4 Competence of nurse educators

The availability of competent nurse educators may have a significant effect on improving student achievement in the 21st century where technology is driving education in the health care sector (Hugo and Fakude 2016:10). This means that nurse educators in the 21st century should keep up to date with new trends in their subject field, as well as with new developments to harness technological means in teaching and learning to prepare students for clinical challenges in the workplace. Ideally, for effective teaching, nurse educators should be allocated to teach subjects where they have clinical expertise. Inadequate subject didactics has been reported to be a challenge in some NEIs, mainly due to shortage

of nurse educators, which results in rotating them to ensure continued teaching to the detriment of the student (Ndawo 2013:62).

In addition, nurse educators are expected to engage in lifelong learning and research to remain current in their teaching; however, this vision is not shared by all as research has shown that some view this as a waste of time (Ndawo 2013:64). Training in e-learning technology is essential in teaching undergraduate nursing students in the 21st century for research, teaching and encouraging students to read broadly (Bhana 2014:1433).

2.3.5 Technological and management support

According to Doyle, Garrett and Currie (2014:776), integrating mobile technological devices into undergraduate nursing teaching and learning requires technological and management support. Technological support in setting up, ensuring consistent Wi-Fi network availability, and acquisition of computers and software programs all require funding and management support for their smooth running and success (Rispel 2015:1). Additionally, upskilling of nurse educators and ongoing technological support are also pivotal in ensuring the efficient utilisation of technological means in classroom teaching (Hudson and Buell 2011:779). NEIs should provide resources and training for nurse educators during curriculum planning stages to equip the nurse educators with relevant skills to use technological means in teaching students (Hugo and Fakude 2016:10). (Frenk, et al (2010:1940) provide a breakdown of current global limitations in health care education, make the recommendation to incorporate technological resources in addressing the changing needs of health care professionals training, including student nurse training. This recommendation intends to encourage and promote critical thinking among students by harnessing the power of technology in teaching and learning when dealing with large volumes of information.

2.3.6 Conducive learning environment

According to Bay and Subido (2014:620), a conducive learning environment refers to a variety of components and activities within which learning occurs. The components of a conducive learning environment include the nurse educator, who is a facilitator of learning, the student, who is the recipient of learning, and the environment within which learning occurs. All these components promote a conducive learning environment and determine the success of student learning (Ahmad, Nidzam, Ainoor Shaharim and Lee Abdullah 2017:57-58). The learning environment should be a peaceful one that will enhance learning. In addition, the learning environment should be humanistic, authentic, supportive and caring (Meyer and van Niekerk 2008:107).

The teaching strategies utilised by the nurse educator should ideally be ones that are in line with 21st century teaching and learning, and that will stimulate students' critical thinking, active participation and eagerness to learn. Furthermore, for students to be able to interact with their learning environment and the teaching itself, all their senses need to be stimulated in the pursuit of new knowledge. Interactive and creative teaching strategies need to be utilised by the nurse educator, in line with 21st century teaching and learning (Ahmad, et al 2017:58).

The 21st century teaching and learning environment has to move away from reproducing information, with students as passive learners, to innovation and creativity, with students being actively involved in communicating and collaborating with each other using various platforms of social media, such as WhatsApp, Facebook and Twitter (Chai, Deng, Tsai, Koh and Tsai 2014:390). A learning environment that promotes students' capacity to think independently, actively participate and demonstrate higher-order skills such as analysis, evaluation and synthesis, is a conducive learning environment of the 21st century (Wharton, Goodwin and Cameron 2014:72).

2.3.7 Expectations about learning

According to Wharton, et al (2014:72), nurse educators and managers of NEIs are expected to understand the learning experiences of the 21st century student if they are to facilitate the effective teaching and learning of this student. The authors further assert that, if NEIs fail to review traditional practices and adapt innovative and more modern teaching practices, the experiences of 21st century students will be limited and disadvantaged. Nurse educators expect 21st century students to take ownership of their learning and to be actively involved both in and outside the classroom; however, this autonomy should not be expected of students without the necessary support from nurse educators (Van den Hurk 2011:157). Most 21st century students are technologically literate as they have been exposed to technology from an early age. Consequently, these students have an expectation of speed in how they communicate, learn and collaborate. For example, they prefer instant messaging and texting to emails, and they would take pictures of PowerPoint slides than take notes in class (Lemley, Schumacher and Vesey 2014:102). Furthermore, these students have a short attention span, so they get bored very easily and expect the nurse educator to keep lessons to the point and engage them actively in their learning. Twenty-first century students expect teamwork between themselves and the nurse educator, and they prefer being involved in matters concerning learning, teaching and assessment, as well as in problem-solving should such be encountered.

According to Lamley, et al (2014:103-104), nurse educators view technological means as tools to enhance teaching. However, 21st century students view these tools as integral parts of their everyday life and so expect nurse educators to utilise them in everyday teaching and learning, and to

communicate with students even after classes (Lamley, et al 2014:103). Although 21st century students' immersion in technological access to information and communication give them a sense of competency, this is not a true reflection of what they actually know and are skilled to do. The nurse educator still has the sole responsibility of facilitating learning and supporting students in the learning process until they all reach their full potential (Franklin 2011:273).

2.3.8 Classroom policy on the use of technological means in class

The wide variety of web-based activities facilitated by technological means, such as Facebook, Twitter and WhatsApp, and the vast popularity of their use among the undergraduate students imply that distraction is more prevalent than ever before (Aaron and Lipton 2018:364). McCoy (2016:9) found that some students used their technological devices in class up to 30 times a day, and this use was not solely related to lesson content. Tindell and Bohlander (2012:1) concur that up to 92% of students have used their devices to text during class time.

This untoward behaviour causes problems in the management of the classroom and disruption of lessons if not properly handled by the nurse educator at the beginning of the lesson by setting class rules and "do's and don'ts" (Tindell and Bohlander 2012:2). Furthermore, the authors strongly recommended that every institution of higher learning should have a smartphone policy in their regulations, which should be articulated and understood by all students. Violation of this policy should incur serious consequences. Orlando (2011:9-10) is of the view that taking time to train students in how to use the technological means that have been agreed upon to be used in class is very important. Most students are not well conversant with using technological means such as blogs, Skype, dashboards and document sharing, so for the nurse educator to assume that undergraduate students, as digital natives, are conversant will all these could be wrong. Nurse educators should be clear on how and when they want students to use their devices in class to avoid students going astray during classroom engagements.

2.4 TEACHING STRATEGIES THAT CAN BE USED TO INFLUENCE TEACHING AND LEARNING OF UNDERGRADUATE NURSING STUDENTS IN THE 21ST CENTURY

A decade ago, the nurse educator was the sole source of information that students needed to succeed in their careers. Currently, however, a new environment exists for which nurse educators were not prepared (Franklin 2015:1090). The didactic approach is still the most commonly used teaching style; however, facilitation of learning that acknowledges students' previous experiences and learning styles so that they become independent is the most suitable style (Islam, et al 2015:103). Teaching strategies that can be used by the nurse educator in the 21st century are, among others, discussion boards, role-

play, case studies, simulations, debates and gaming (Bhana 2014:1433-1434). However, these strategies should harmonise with the values and learning needs of undergraduate nursing students.

2.4.1 Discussion boards

According to Sheen, AlJassmi and Jordan (2017:75-76), a discussion board is an online forum where people can exchange information in the form of posted messages. The topics on the discussion boards are referred to as “threads”, and students can respond to these topics in the form of “posts”. These discussion boards are moderated by the nurse educator, who facilitates the discussion. Students become engaged while interacting with others and learning from other students’ threads, and are able to voice their opinions about the subject matter being discussed without fear of intimidation – this is especially the case for students who rarely participate in class. Sheen, et al (2017:75-76) further assert that discussion boards result students being actively engaged in their own learning, which in turn yields a broader knowledge base and a desire to learn more about the subject matter.

2.4.2 Role-play

Role-play is one of the creative methods of teaching which may provide undergraduate students with a meaningful, positive and deep learning experience (Rankin and Brown 2016:97-98). According to Stevens (2015:481), role-play facilitates retention of learned content as students, including passive students, become actively involved in teaching and learning. Contrary to this belief, in a study conducted in Melbourne, Australia, a small minority of the population stated that they gained very little from role-play. Stevens (2015:481) argues that unprepared students or poorly performing students may find role-play to be unfruitful.

Creativity is one of the methods of through which millennial students learn, and this resonates with the relevancy of role-play as a teaching strategy, as role-play also facilitates collaborative learning without any fear of embarrassment and interference from the nurse educator, while ensuring equal participation from every student (Gunn 2010:313). Furthermore, role-play stimulates students’ enthusiasm for learning and ensures a more personalised view of the learning content as they gain a deeper understanding and access into lived experiences related to the learning content. Support from the nurse educator and peers encourages the undergraduate nursing student to want to participate in the activity, as the student would be alone and independently acting out the scenario to be role-played (Rankin and Brown 2016:97). Students can video record each other while role-playing the scenarios, using their smartphones.

2.4.3 Case studies

Case studies are time-managed teaching strategies that utilise correlation between theory and practice learned, at the same time promoting critical thinking and decision-making (Hara, Aredes, Fonseca, Silveira, Camargo and De Goes 2016:119; Vogt and Schaffner 2016:80). Case studies engage students and develop their critical thinking skills; however, they can be time-consuming in terms of preparation and the nurse educator's inability to cover the entirety of the content (Freeman Herreid and Schiller 2013:62). Critical thinking is important as it is used daily in clinical decision-making and problem-solving, and it is a necessary skill in 21st century learning (Popil 2011:204-205). In addition, case studies may provide dilemmas in practice, increase students' range of strategies for problem-solving, help students to understand complex and complicated issues, and encourage students' investigative and analytic skills (Anastasiou and Alves 2012 as cited in Hara, et al 2016:119). The nurse educator's role is that of support and facilitator of student learning, making learning relevant to students' lives (Saavedra and Opfer 2012:9). According to Vogt and Schaffner (2016:80), in line with 21st century teaching and learning, case studies can now be presented online or in blended learning teaching strategies, through the use of technological means in teaching and learning such as Facebook, YouTube videos, blogs and even WhatsApp. Digital case studies provide different types of learning based on the learning outcomes and the technological means utilised. They also enhance the students' ability to carry out complex tasks, which could be challenging to perform in a real situation due to risks involved (Hara, et al 2016:122).

2.4.4 Simulation

Simulation is the art and science of recreating a clinical scenario in an artificial setting (Xu 2016:54). Miller and Bull (2013:241) state that simulation provides an opportunity for students to acquire and practise clinical skills and learn from their errors, while developing competency in a safe and controlled environment without potential harm to patients. According to MacLean, Geddes, Kelley and Della (2018:85), simulation also assists students to rehearse communication skills with patients, which is proving to be a challenge for 21st century students. Students are challenged to analyse problems critically, often with very little information given, and to then decide on appropriate intervention (Mills, et al 2014:12). The nurse educator's role is to address misunderstandings and demonstrate procedures accurately (Saavedra and Opfer 2012:11); for this reason, debriefing sessions with students are necessary afterwards to improve clinical reasoning and critical skills. As in real-life scenarios, students will be expected to think on the spot and there will be no time to ponder on a decision to be taken (Xu 2016:54).

2.4.5 Debates

Xu (2016:56) states that debates refer to presenting the “pro” and “con” arguments of a specific solution to a problem. Students learn new content in an exciting way and collaborate with others, which is one of the 21st century learning conditions (Saavedra and Opfer 2012:12; Xu 2016:56). According to Toor, Samai and Wargo (2017:428), using debate as teaching strategy for undergraduate students in the 21st century makes learning more enjoyable, as students participate and interact with one another in a creative format. Verbal communication skills and active involvement in learning become a reality. Students can video record themselves while conducting the debate, utilising technological devices such as smartphones. Feedback provided by the nurse educator facilitates teaching, and promotes critical thinking and teamwork, which are some of the attributes needed for teaching undergraduate nursing students in the 21st century (Xu 2016:56).

2.4.6 Gaming

Gaming encourages active involvement and increases both the motivation and interest of the student by promoting creativity and fun while replicating real-life situations (Xu 2016:55). Additionally, learning is made relevant to undergraduate nursing students’ lives (Saavedra and Opfer 2012:9). Topics that resonate with students and nurse educator alike can be taught using gaming so that students can see how the topic fits into the broader picture. Strickland and Kaylor (2016:101) concur that a large volume of work can be covered in one gaming activity, and multiple learning styles can be engaged, which is to the nurse educator’s advantage when teaching a large group with diverse learning styles.

2.4.7 Use of social media

Social media refers to real-time information-sharing within virtual communities through web-based platforms (Smith and Milnes 2017:99). Social media platforms include Facebook for social networking, YouTube for media sharing, and Twitter and Tumblr for blogs and micro-blogs. Social media has become a popular networking tool that has transformed how people communicate (Peck 2014:164). Additionally, social media is cost-effective, convenient and unlimited with regard to time and space, and is used extensively by undergraduate nursing students (Cain and Fink 2010:1).

According to Tuominen, Stolt and Salminen (2014:1), the use of social media in nursing education is limited, and thus there is less active use of various new developed learning environments such as blended learning. In Tuominen, et al’s (2014) study, it was clear that students used social media applications more in their free time than in their studies in the classroom. Online community services such as Twitter, blogs and Facebook were the most commonly used applications in students’ free time,

while the e-learning environment was the most used in their studies. Students even hoped that teaching would be organised so that difficult courses were offered in classrooms and easier courses through social media to improve their learning (Tuominen, et al 2014:2). Different types of social media tools can used for information sharing, developing communication skills and collaboration, making learning more student- than teacher-centred, as advocated by Carl Rogers' theory of student-centredness (Smith and Milnes 2016:99).

According to Orlando (2011:13), posting information and videos of topics of interest and inviting people to comment on them helps students to structure their learning outside the classroom. In addition, most learning occurs outside the classroom for most undergraduate millennial students through platforms such as Facebook, which offers students a personal learning environment where they can pursue other intellectual interests. This focus on personal interests may result in research being undertaken and the development of forums for discussions which are open to the whole world of people who share the same thoughts and interests. This phenomenon may result in the development of self- structured and self-organised learning environments, collaboration with fellow peers, and improvement in communication and thinking skills. Higher learning institutions may help promote this type of learning among undergraduate students, which could be beneficial to students in future (Orlando 2011:13-14).

Nurse educators need to be familiar with the social media applications used by their students and how they are used, and they need to evaluate the usability of these platforms and digital learning materials in the classroom (Sharoff 2010:301). Different types of social media require different pedagogical and technological skills from the nurse educators in order for them to be effectively utilised in teaching and learning by the students (Tuominen, et al 2014:1). Lack of familiarity with technology has been observed to be a reason for the delay in using social media applications in NEIs (Makgatho 2012:199).

According to Kotcherlakota, Kupzyk and Rejda (2017:117), nurse educators' training should include technical training, especially in the use of social media, so as to enable its effective utilisation in nursing education. Nurse educators should be on the lookout for improper use of social media in the classroom, which can have adverse effects for themselves, the students and the institution; this can be remedied by developing policies regarding social media use by the NEI to promote responsible use and disciplinary procedures to be instituted when violation of policy is observed (Akoh 2012:18). Dzvapatsva, Mitrovic and Dietrich (2014:4) point out that, due to the fact that students can use these platforms at liberty, more responsibility and self-discipline from the student are required.

2.4.8 YouTube videos

YouTube videos are an ideal teaching strategy as undergraduate students often suffer decreased attention span and boredom due to the array of devices they have at their disposal that demand their attention (Clifton and Mann 2011:311). YouTube videos are universal and can be accessed anywhere, anytime, provided that there is an internet connection, so students can engage with their learning anywhere, using their own devices (Clifton and Mann 2011:312; May, Wedgeworth and Bingham 2013:408). Twenty-first century students are technologically literate and very familiar with YouTube, so nurse educators are expected to be skilled in using e-learning technologies and e-tools so as not to hamper students' progress (Van der Merwe, Van Zyl, Nel and Joubert 2014:12). The value of nurse educators is not in the information they can relate to students but in their ability to put together learning resources that can benefit the students. Videos bring the best learning resources to students in that, when a nurse educator cannot fully explain something in simpler terms, there could someone who explains it better in a YouTube video (Orlando 2011:15).

2.4.9 Twitter

Twitter is a social media tool that is free to use and that allows for easy and affordable access (Peck 2014:166). In addition, most undergraduate nursing students are familiar and comfortable with using this tool to post a live stream of their insights during class, summarise work done and share information with colleagues. Zgheib (2014:1) argues that social media tools such as Twitter are now being used by students to engage with others in their learning and not only for leisure. Dzvapatsva, et al (2014:1) suggest that students who were unable to express their views in the lecture method have an opportunity now to use Twitter to give prompt feedback to their nurse educators and colleagues, to indicate their understanding of the content taught. Dzvapatsva, et al (2014:2) concur that Twitter enables teaching and learning to be ongoing and not only confined to the classroom as in the lecture method. Students and nurse educators interact in a flexible way both during and outside class, as students co-create knowledge and develop critiquing skills during this interaction, in line with Carl Rogers' student-centred approach to teaching and learning (Conole and Alevizou 2010:21). In addition, Chawinga (2017:1) concurs with this view that Twitter is a catalyst for a student-centred approach, as his study showed that students discussed, interacted and reflected on course content with their lecturers around the clock, thus taking the lead in their learning.

2.5 THEORETICAL PERSPECTIVES

The study was guided by Carl Rogers' student-centred approach, which is an approach where students are given choices regarding how and what they learn, based on the premise that students succeed when

they can relate their own interests to the instructional material and real-life experience (Richmond 2014:1). This approach is driven by the teaching philosophy of collaborative learning within a contextual learning environment that relates to students' day-to-day life experiences. In addition, student-centred learning also refers to freedom of students to study those topics that are of interest, as well as determining how students want to study those topics. In most cases, this results in deeper learning and lifelong learning on the part of students (Zuyderduin, Pienaar and Bereda-Thakhathi 2016:246).

According to Bassendowski and Petrucka (2013:665), the student-centred approach regards students as actively participating by working alongside the nurse educator in the learning environment and exploring different aspects expected in their learning. Various terms are used to refer to this concept – student-centred learning, personalised learning, student–educator partnership, adaptive learning and collaborative learning. In student-centred learning environments, the nurse educator focuses more on facilitating than lecturing, and the classroom physical environment is often more flexible as well, with an open seating plan and no obvious "front" of the classroom (Richmond 2014:1). This, however, may be hindered by rigid classrooms where seats are fixed, making alternative seating arrangements impossible, for example in auditoriums. Hugo and Fakude (2016:57) concur that the student-centred approach focuses on what can be done to enhance learning, and acknowledges differences among students and how such differences impact on learning. Students learn more in a student-centred teaching and learning environment, and they learn to reflect on their learning process, thus leading to the development of reasoning and problem-solving skills. Ideas and information are shared among students, confidence is built up, and public speaking, confidence, communication skills and interpersonal skills are cultivated as students take part in group discussions and presentations (Linda, Daniels, Fakude, Rugira and Modeste 2014:89).

One of the ways to realise a student-centred approach to teaching and learning is by using case-based teaching as a teaching strategy, as it is said to promote students' critical thinking and decision-making skills by making suggestions based on the material provided (Linda, et al 2014:92). Linda, et al (2014:92) concur that, in case-based teaching, students are required to analyse scenarios presented, and come up with and decide on solutions to solve those identified problems, supported by the nurse educator who acts as a facilitator of this teaching and learning experience. Students' active participation in creating knowledge and understanding is key in the student-centred approach to teaching and learning, as well as group work. Feedback from students regarding their concerns and untoward experiences is necessary so as to effect improvements and guide nurse educators to further improve teaching aimed at promoting student-centredness.

2.6 CONCLUSION

This chapter presented a literature review on technological means influencing the teaching and learning of undergraduate students in the 21st century and teaching and learning in the classroom. A humanistic approach to learning, based on Carl Rogers' theory of student-centredness, guided the study, where traditional teaching and learning approaches are compared to student-centred approaches to teaching and learning. Chapter 3 discusses the research design and methods followed in this study.

CHAPTER 3
RESEARCH DESIGN AND METHODS

3.1 INTRODUCTION

In the previous chapter, literature discussing the technological means and teaching strategies used in 21st century undergraduate students' teaching and learning was reviewed. This chapter discusses the research design, study setting, study population, sampling method, sampling size, inclusion and exclusion criteria, data collection instrument, structure of the questionnaire, pilot study, data collection, measures to enhance quality control, and data analysis for this study. The purpose of this study was to determine the technological means used in 21st century undergraduate students' teaching and learning at an NEI in Tshwane.

3.2 RESEARCH METHOD

A research method is a technique to be followed in order to obtain information about the problem to be studied (Burns and Grove 2009:218; Hofstee 2011:108). A quantitative research method is a formal, objective, systematic process in which numerical data are utilised to obtain information about a phenomenon (Burns and Grove 2009:218; Botma, et al 2010:82-83). In this study, a quantitative research method with a non-experimental descriptive design was used to determine technological means used in 21st century undergraduate students' teaching and learning at an NEI in Tshwane.

3.2.1 Study design

According to Botma, et al (2010:108), a study design is the backbone of the study which provides the structure for the research methods and decisions to be taken to plan the study. In addition, Burns and Grove (2011:49) describe a study design as a blueprint for conducting the study, which maximises control over factors that could interfere with the desired outcome. A quantitative, non-experimental descriptive design was followed in this study to determine technological means used in the teaching and learning of undergraduate students at an NEI in Tshwane.

3.2.1.1 Quantitative design

A quantitative research design is a formal, objective, systematic process in which numerical data are employed to obtain information about a phenomenon (Burns and Grove 2009:218; Botma, et al 2010:82-83). A descriptive design is a non-experimental study design that aims at describing a situation as it naturally occurs (Polit and Beck 2012:226). Descriptive designs enable the researcher to gather more

information about characteristics within a particular field of study and to provide a picture of situations as they naturally happen (Burns and Grove 2009:237). No manipulation of variables is involved in a descriptive design. The researcher opted for a quantitative research design because empirical evidence was preferred to personal beliefs. The large population size also warranted the utilisation of a quantitative research design.

A survey provides numeric descriptions of trends, attitudes and opinions among a population by studying a sample of that population so that generalisations can be made (Creswell 2014:155). For the purpose of this study, a quantitative, non-experimental descriptive survey was used to determine technological means used in 21st century undergraduate students' teaching and learning at an NEI in Tshwane. Data were collected from level 2, level 3 and level 4 undergraduate students using a structured questionnaire.

3.3 STUDY SETTING

According to Burns and Grove (2009:226) and Polit and Beck (2012:49), a study setting is a specific natural environment where a study is carried out or where information is gathered. This environment cannot be manipulated by the researcher. In this study, the study setting was a specific NEI in Tshwane where undergraduate students are enrolled for the four-year Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425). Other programmes offered at the NEI are a Diploma in Psychiatric Nursing (R.880), a one-year post-basic programme with 30 students enrolled, and a Diploma in Primary Health Care (R.118), a one-year post-basic programme with 21 students enrolled. The NEI is government funded and technological resources currently available are desktop computers at the library, which are accessible to students, and bursary-funded tablets, which were issued to the level 2 students. The researcher chose this study setting as it was convenient in terms of travelling time, costs and proximity.

3.4 RESEARCH POPULATION AND SAMPLING

3.4.1 Population

Polit and Beck (2012:738) describe a population as the entire set of individuals possessing common characteristics. In addition, Welman, Kruger and Mitchell (2012:52) describe a study population as the total number of all people about whom the researcher wishes to make specific conclusions, from which a sample is taken. This study was conducted on a population group consisting of all second-, third- and fourth-year undergraduate students enrolled for the four-year Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425). At the time of the study, there were approximately 800 students

(n=800) enrolled for the four-year Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425) at the selected NEI in Tshwane.

3.4.2 Sample

Bless, et al (2013:395) and Botma, et al (2010:124) describe a sample as a group of elements considered to be representative of a larger population group from which it is drawn, so that conclusions can be drawn about the larger population. The sample in this study comprised 89 each of level 2, level 3 and level 4 students who were drawn from the larger population of approximately 800 students enrolled for the Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425) at the selected NEI in Tshwane.

3.4.2.1 Sampling method

Sampling is a process whereby people, events, behaviours or other elements that represent a population being studies are selected (Burns and Grove 2009:343). For the purpose of this study, a probability, multi-stage sampling method with three stages was used.

Multi-stage sampling refers to two or more stages of random sampling based on the hierarchical structures of groups of people or clusters within a population (Sedgwick 2015:1). Multi-stage sampling is often used in cases where the population is too large for random sampling (De Vos, Strydom, Fouche and Delport 2011:230).

a) First stage sampling: Purposive sampling

In this study, the first stage of sampling was to purposively select an NEI in Tshwane, which had the population of approximately 800 students. Purposive sampling refers to a conscious selection of elements or incidents to include in the study by the researcher (Burns, Grove and Gray 2013:365).

b) Second stage sampling: Stratified random sampling

Stratified random sampling refers to dividing the population into strata or homogenous segments that are mutually exclusive, with regard to aspects such as age, gender or level of education (De Vos, et al 2011:230). Stratified random sampling is used when the researcher is familiar with some important variables in the population necessary for attaining representativeness, for example gender or age (Burns, et al 2013:359).

A stratified random sampling method was used to divide the population into three strata or groups, namely, level 2, level 3 and level 4 undergraduate students, to enhance representativeness (Polit and Beck 2012:281).

c) Third stage sampling: Simple random sampling

The last stage was to use simple random sampling without replacement to select 89 students from each level, which would give a total sample size of 267 students. According to Polit and Beck (2012:280), simple random sampling is the most basic probability sampling whereby a sampling frame would be established. Every individual in the population has an equal chance of being selected for the sample (De Vos, et al 2011:228).

3.4.2.2 Sample size

Creswell (2014:159) describes sample size as the number of people in the sample and the procedures used to compute this number. The adequacy of the sample size was determined before data were collected as, the larger the sample, the smaller the sample error becomes and the more accurate predictions can be. For the purpose of this study, a statistician was consulted for assistance to select a representative sample. Yamane's (1967:886) formula for calculating the sample size was used:

$$n = \frac{N}{1 + N(e)2}$$

Where n is the sample size, N (800 for students) is the population size, and where 95% confidence level and p = 0.05 are assumed. Substituting all these values in the equation, the sample size of 267, consisting of 89 students per level of undergraduate students, was obtained.

3.4.2.3 Inclusion and exclusion criteria

a) Inclusion criteria

Inclusion criteria also referred to as eligibility criteria, referring to people who should be included in the study population (Botma, et al 2010:124). The inclusion criteria considered in this study were all level 2, level 3 and level 4 undergraduate nursing students aged 18 and older. These students were enrolled for the four-year Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425) at the specific NEI in Tshwane during the 2017 academic year.

b) Exclusion criteria

Sampling criteria specify features that a population does not have (Polit and Beck 2012:727). All level 1 students were excluded from the study as they had just recently been enrolled for the four-year Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425) course at the selected NEI in Tshwane and would not have given valid inputs.

3.5 DATA COLLECTION

Burns and Grove (2009:43) refer to data collection as a systematic and precise gathering of information in order to resolve a research purpose. In this study, a survey was conducted, which is a descriptive data collection method through which all relevant data from the sample are collected in order to answer the research questions (Creswell 2014:157). A survey method was chosen as the study had a broad scope and a survey allowed the researcher to focus on a wide range of topics. Additionally, it allowed the allocation of numerical values to non-numerical characteristics of human behaviour to make generally valid interpretations possible (Creswell 2014:157).

Data were collected after ethical clearance from the University of Pretoria Research Ethics Committee, as well as written permission from the Tshwane Research Committee, the Gauteng Department of Health and the principal of the NEI where the study was conducted, had been obtained. Collection of data was done over a period of six weeks from February to April 2018, including the pilot study. Respondents were assembled in a separate classroom, undisturbed by noise and other students.

Respondent information leaflets, which included the title, purpose of the study, instructions to respondents, risks and benefits of the study, contact details of the researcher, and consent form, were first handed out to the respondents to read and complete before starting out on the questionnaire. Completing the questionnaire was evidence of voluntary participation in the study.

A significant amount of quantitative data were collected using a structured questionnaire. The questionnaire used in this study is included as Annexure B. The questionnaire was given out to 89 respondents from each level, level 2 to level 4, and respondents were allowed to take the questionnaires home to complete in their own spare time. Levels 3 and level 4 returned all completed questionnaires; however, level 2 returned 73 completed questionnaires.

Respondents were thanked for taking time out to complete the questionnaires and for their inputs during administration of the questionnaire.

3.5.1 Data collection instrument

A structured self-reported questionnaire with open- and closed-ended questions and a five- point Likert scale type of assessment was used to collect data due to the fact that the study population was too large to be observed directly.

A questionnaire was preferred as it approaches the task directly and can solicit information such as beliefs and attitudes easily without directly asking the respondents or making respondents feel apprehensive (LoBiondo-Wood and Haber 2006:326-327). In addition, a questionnaire is less expensive to administer as no training is needed as with training interviewers for interviews, and complete anonymity is ensured in cases of sensitive topics. Bias is also reduced as the respondents are not persuaded to answer in a particular way (LoBiondo-Wood and Haber 2006:328).

The questionnaire was developed by the researcher herself, with guidance from reviewed literature and support from her supervisor and co-supervisor. The statistician finalised the content of the questions and their relationship to aims and objectives of the study.

3.5.2 Structure of the questionnaire

The questions were grouped according to three main sections based on the research aim and objectives. The three sections were as follows:

- Section A: Demographic backgrounds of students, including their level of study.
- Section B: Open- and closed-ended questions on technological means of teaching and learning.
- Section C: Five-point Likert scale on teaching and learning in the classroom. Twenty-seven structured closed-ended and 11 unstructured open-ended questions were included in the questionnaire.

Open-ended questions are not grounded on predetermined answers and allow more data to be collected (Botma, et al 2010:134). They were therefore deemed appropriate for the descriptive non-experimental study. Closed-ended questions consisted of multiple-choice questions, some dichotomous questions, one rating-scale type question and five-point Likert scale questions (Burns, et al 2013:427). Furthermore, questions were formulated in such a way that they all had a lead and response part, with clear and brief sentences as long questions tend to discourage respondents and some ultimately lose interest in the study (Burns and Grove 2009:406).

3.5.3 Quality control

Quality control refers to plans and procedures put in place to ensure accuracy and quality of data collected (Botma, et al 2010:82, 84). In this study, quality control was observed by ensuring that the data collection instrument was valid and reliable.

3.5.3.1 Validity

Validity of an instrument determines the extent to which the instrument measures what it is supposed to measure (Burns and Grove 2009:380), and can be divided into content validity and face validity.

Content validity refers to the extent to which the instrument includes all major elements relevant to the construct being measured (Burns and Grove 2009:381). In this study, content was confirmed by the statistician by ensuring that questions asked were focused on the research questions: “What are the technological means in 21st century undergraduate students’ teaching and learning?”.

Face validity refers to whether the instrument appears to measure the target construct to be measured (Polit and Beck 2012:336). Face and content validity were checked by content experts for irregularities and acceptance. The experts in this study were the supervisor, who is an expert in nursing education, the co-supervisor and statistician, who are experts in quantitative research, and the researcher.

3.5.3.2 Reliability

According to Heale and Twycross (2015:66) and Botma, et al (2010:176), reliability refers to the extent to which a research instrument consistently has the same result if used in the same situation on repeated occasions. Reliability testing focuses on three main aspects: stability, equivalence and homogeneity (Jooste 2010:322).

Stability of a test is measured by administering the same test to a sample twice and comparing scores using a correlation coefficient tool (Polit and Beck 2012:331), while **equivalence** is where there is a high level of agreement between the two observers and the assumption is that errors have been minimised. **Homogeneity** determines whether various items within an instrument consistently measure the construct – in this study, determining technological means in 21st century undergraduate students’ teaching and learning at an NEI in Tshwane (Jooste 2010:323).

In this study, reliability of the measuring instrument was determined during the pilot study, by ensuring that an accurate representation of the total population under study was referred to, and through the consistency of responses from level 2, level 3 and level 4 students (Polit and Beck 2012:335).

Inter-rater reliability was assessed by the agreement between the statistician and the supervisors on similarity among the respondents in the responses to each question asked.

3.6 PILOT STUDY

According to Brink, Van der Walt and Van Rensburg (2018:161) and Botma, et al (2010:275), a pilot study, often referred to as a preliminary study, should be conducted in order to test the reasonableness of the research study. A pilot study also gives the researcher an indication of whether or not the actual respondents would understand the questionnaire. In addition, the pilot study aims to determine whether instructions to respondents are clear, and that ambiguity and cultural insensitivity have been excluded. According to Burns, et al (2013:428), the questionnaire should be piloted in order to test its validity and reliability.

The questionnaire was given to the researcher's supervisor, co-supervisor and the statistician, who are all experts in the fields of research, nursing education and quantitative research, to check for validity.

After receiving ethical clearance from the ethics committee of the University of Pretoria Ethics Committee, the Gauteng Department of Health, Tshwane Research Committee and the NEI where the study was to be undertaken, a pilot study was conducted on 10 respondents from each level (level 2, level 3 and level 4 students) to pre-test the questionnaire, to exclude any grammatical and typing errors, and to assess whether the questions elicited the desired information or not (Burns and Grove 2009:409).The sample for the pilot study was statically determined. Instructions on how to complete the questionnaire were given and explained during the pilot study, as well as the estimated time it would take to complete the questionnaire, so that respondents would not utilise more time more than was actually needed.

Permission to continue with the actual study after the pilot study was granted by the researcher's supervisors and the statistician. The results of the pilot were that question 33, which tested the percentage of time respondents would allocate for each different teaching style, was not clear, and in one open-ended question, which tested respondent's views on a conducive environment to classroom learning, some respondents did not understand the concept "conducive" and needed clarification. Some modifications were done on questions 33 and 34 of the questionnaire to incorporate lessons learnt during the pilot study. Data collected during the pilot study were not included in the main study.

3.7 DATA ANALYSIS

Data analysis entails organising and processing all collected data in a systematic pattern in order to reduce the data and communicate numeric information so as to give the data meaning (Burns and Grove

2009:14; Polit and Beck 2012:379). After data collection, a total of 251 completed questions were returned. All questionnaires were first checked for completeness and legibility; however, missing pieces of information could not be retrieved as respondents were at different clinical facilities. Identification numbers were assigned to each received questionnaire.

Data were logged in an Excel spreadsheet. All open-ended questions were coded separately and closed-ended questions were assigned numeric codes by the researcher. Original questionnaires were then locked up safely to comply with anonymity and confidentiality promised in the informed consent (Botma, et al 2010:147). The statistician was consulted, who stored the data in formatted text (space delimited-prn format) and analysed the data with a statistical package (SAS version 9.4) to run descriptive statistics and frequencies.

Nominal and ordinal levels of measurements were utilised in this study. According to Botma, et al (2010:132) and Polit and Beck (2012:720), the nominal level of measurement involves assigning numbers to classify certain pre-existing characteristics of respondents, and can be indicated by frequency count, percentages and proportions. The ordinal level of measurement involves categorising and sorting data according to a relative ranking or criteria of a characteristic, and can be indicated by frequency count, percentages and proportions. Data collected have been illustrated through graphs and pie charts for easy comprehension, interpretation and utilisation (Botma, et al 2010:132; De Vos, et al 2011:254).

3.8 CONCLUSION

This chapter discussed the research design and method. A quantitative, non-experimental descriptive survey using a structured questionnaire was used to determine technological means in the teaching and learning of undergraduate students in the 21st century at a specific NEI in Tshwane. The study consisted of a population of approximately 800 students from which a sample was selected. A probability multi-stage sampling method was utilised to purposively select the specific NEI in Tshwane, the population of which was divided using stratified random sampling into three strata, namely level 2, level 3 and level 4 students. The last stage of sampling was to select 89 students from each level using simple random sampling without replacement, giving a total sample size of 267 students. A structured self-administered questionnaire with closed- and open-ended questions was used to collect data from the respondents, and 251 questions were returned in total. The following chapter discusses and provides an interpretation of results about how teaching and learning of undergraduate students in the 21st century are influenced by technological means.

CHAPTER 4
DISCUSSION AND INTERPRETATION OF RESULTS

4.1 INTRODUCTION

The previous chapter discussed the study design, study setting, population, sampling and data collection. This chapter outlines the presentation and interpretation of results in the form of tables and graphs. The purpose of the study was to determine technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane. A quantitative, non-experimental descriptive survey was used to conduct the study.

A multistage sampling method was used for the study. The first stage was to purposively select the NEI in Tshwane where the study was conducted. Stratified random sampling was used to divide the population into three strata or groups, namely, level 2, level 3 and level 4 undergraduate students to enhance representativeness. Simple random sampling without replacement, the last stage of sampling, was used to select 89 students from each year to participate in the study, giving a sample size of 267 students. A statistical program, SAS version 9.4, was used to analyse all the data.

Data were collected from 267 level 2, level 3 and level 4 undergraduate students from using a questionnaire. A total of 251 questionnaires were returned. Level 3 and level 4 respondents all returned completed questionnaires; however, from the level 2 respondents, only 73 respondents returned completed questionnaire that could be used for the study.

Data based on the following sections were captured and analysed:

1. Section A: Demographic data
2. Section B: Technological means in 21st century undergraduate students' teaching and learning
3. Section C: Teaching and learning in the classroom

4.2 DATA ANALYSIS

Data were obtained from 251 undergraduate students out of the total sample size of 267 students who were invited to participate. Level 2 students returned 73 (82%) completed questionnaires, whereas level 3 and level 4 students returned each level 89 (94%) completed questionnaires, giving a total of 251 completed questionnaires.

Data capturing was done in Excel together with the statistician, closed-ended questions were coded according to specifications of the statistical package utilised, SAS version 9.4. Open-ended questions

were analysed according to themes and then coded as directed by the statistician. The chi-square test (X^2) for independence in a two-way contingency table was used to determine whether there was an association between technological means in teaching and learning and the level of training of undergraduate students. Upon receiving data back from the statistician, a quality check was done to rule out any errors.

Results are presented in this chapter in the form of graphs and tables using percentages and frequencies.

4.2.1 Section A: Demographic data

Table 4.1: Response rate of students from level 2, 3 and 4, age and gender (n=267) student

Student Level	Number of questionnaires issued (%)	Number of questionnaires returned (%)	Age < 21	Age 21-25	Age 26-30	Age >30	Age not recorded	Gender: Female (%)	Gender: Male (%)	Gender not recorded
2	89 (95%)	73 (82%)	5 (7%)	23 (31%)	7 (10%)	13 (18%)	25 (34%)	42 (58%)	7 (10%)	24 (33%)
3	89 (95%)	89 (95%)	3 (3%)	51 (57%)	19 (21%)	12 (14%)	4 (5%)	73 (82%)	12 (13%)	4 (4%)
4	89 (95%)	89 (95%)	0 (0%)	42 (47%)	16 (18%)	28 (32%)	3 (3%)	71 (80%)	15 (17%)	3 (3%)
TOTAL	**270**	**251 (94%)**	**8 (3%)**	**116 (46%)**	**42 (17%)**	**53 (21%)**	**32 (13%)**	**186 (74%)**	**34 (14%)**	**31 (12%)**

A large number of the respondents were female (n=186, 74%), while 34 (14%) were male were and 31 (12%) did not record their gender, as shown in Table 4.1. This is also confirmed in the literature, which indicates that nursing in South Africa is still predominantly a female profession (SANC 2018).

A large number of respondents who were in level 4 were above the age of 30 (n=28, 32%). However, the majority of students from level 3 (n=51, 57%) were within the age range of 21-25 years, which means they were members of Generation Y who used technology daily and who would be happy to use technological means such as Blackboard and flipping classrooms (Helsper and Eynon 2010, cited in Wang, Hsu, Campbell, Coster and Longhurst 2014:639). Such students expect nurse educators to keep up with trends in their subject specialities and to use the latest technological means in teaching and learning as, when offered low-quality products in teaching, Generation Y students are likely to be demotivated (Hugo and Fakude 2016:9).

Most respondents across all levels indicated that they received lessons in English (n=216, 86%), which is the medium of instruction used at the NEI. However, interestingly, some level 2 respondents (n=35, 34%) indicated that English was not the medium of instruction. Hugo and Fakude (2016:14) state that most Grade 12 learners, who would be level 1 undergraduate students, are not well equipped to deal with higher education requirements for learning, due to African languages being the dominant home language for most learners. This is evidenced by poor reading, writing and information literacy skills. Most nurse educators are faced with the challenge of having to explain to students in simpler terms so that they can understand. The use of African languages is often resorted to in order to enhance students' understanding, which is why there is a need for decolonisation of the curriculum to accommodate African students (Le Grange 2016:3).

4.2.2 Section B: Technological means in teaching and learning

In an attempt to identify technological means used in teaching and learning, respondents were asked to indicate how frequently they used technological tools for their studies.

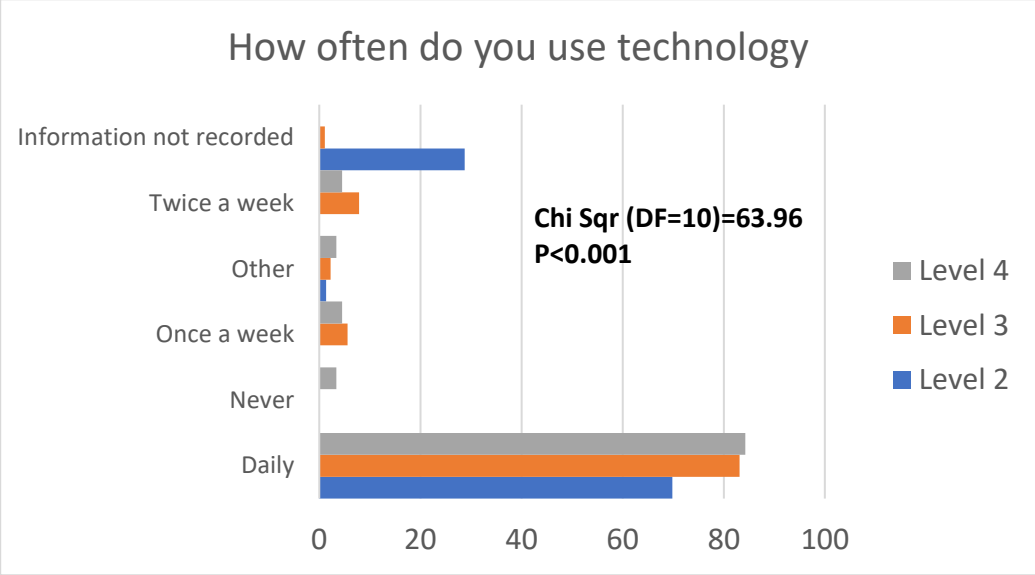

Figure 4.1: Frequency of use of technological tools for all levels of students

Figure 4.1 displays the frequency of use of technological devices in learning by respondents. The chi-squared test indicated a significantly high difference ($p<0.001$) between the respondents' technological use choices, with $X^2 = 63.96$. The majority of respondents used a technological device in their daily learning, evidenced by more than 70% of respondents across level 2 to level 4 indicating this, while 29% of respondents from level 2 did not record their responses. The results of the study could imply that respondents could access information and educational materials from their own technological devices based on the reported daily use of the devices. Additionally, the study results could imply that

respondents only needed encouragement from nurse educators to use these devices in class during teaching to facilitate learning. However, this is limited by the policies of the NEI under study, which restricts device use in class unless instructed to do by the nurse educator.

Wolf, Wenskovitch and Anton (2015:68) attest to the daily use of technological devices because, in today's day and age, sharing information about one's daily routine, personal experiences and whereabouts, even posting pictures or videos as evidence, is common practice as we live in a globally connected world. O'Connor, Joliffe, Stanmore, Renwick, Schmitt and Booth (2017:1990) concur that mobile technological means like smartphones, iPads, tablets and laptops are being used to facilitate learning among undergraduate students and enable students' access to more information to support their learning.

4.2.2.1 PowerPoint lesson presentation medium

Table 4.2: Presentation methods used to deliver lessons in the classroom according to the levels

	PowerPoint		Video		Literature search		Group discussion		Discussion board	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Level 2	52 (71%)	21 (29%)	30 (41%)	43 (59%)	8 (11%)	65 (89%)	35 (48%)	38 (52%)	2 (3%)	71 (97%)
Level 3	88 (99%)	1 (1%)	17 (19%)	72 (81%)	5 (5%)	84 (95%)	36 (40%)	53 (60%)	3 (3%)	86 (97%)
Level 4	89 (100%)	0 (0%)	30 (19%)	72 (81%)	12 (13%)	77 (87%)	56 (63%)	33 (37%)	2 (2%)	87 (98%)

Table 4.2 shows responses regarding the methods used to deliver lessons in class. The results from this study indicated that PowerPoint lesson presentation was the most used to deliver lessons in class, evidenced by 52 (71%) level 2, 88 (99%) level 3 and 89 (100%) level 4 respondents indicating this. The results could mean that nurse educators are incorporating some of the technological means in teaching undergraduate students. However, this medium used on its own may not encourage student-centredness if the nurse educator is only giving information and not facilitating students to search for information themselves.

According to Furst (2011:4), most Generation Y students, also referred to as 21st century students, prefer PowerPoint lessons as they help aid concentration and are easy to learn from due to the summary of content presented. Additionally, since Generation Y students are technologically perceptive, they can take pictures of the slides using their smartphones and share them among themselves during group discussions on social media. Furst (2011:5) further asserts that the learning styles of 21st century

undergraduate students are visual rather than verbal in nature, which is why PowerPoint presentations are favoured. This implies that the nurse educator's teaching effectiveness depends on the ability to adapt to the students' needs (Reilley 2012:3). Students are important stakeholders in identifying their preferred lesson presentation approaches (Hills, Levett-Jones, Lapkin and Warren-Forward 2017:1).

4.2.2.2 Video lesson presentation method

The majority of respondents (n=72, 81%) from level 3 and level 4 were not in favour of the video presentation method. Only 30 (41%) respondents from level 2 preferred video lesson presentation, while 72 (81%) were not in favour of this method. This could be due to the fact that level 2 respondents were in possession of tablets issued by the NEI in collaboration with a subsidising company, as they were bursary funded, unlike the level 3 and level 4 respondents who were still using textbooks. Level 2 respondents had easy access to their tablets without restrictions as they had all the references and textbooks downloaded on their tablets for use in and outside class, although internet access was still a challenge as there is no Wi-Fi access in lecture halls, and the cost of data is very high so most students cannot afford other internet access (Hlatshaneni 2017:1). Contrary to these results, Battersby (2017:121) concurs that the addition of creative teaching strategies such as videos can assist in clarifying confusing concepts, as students learn best by observing, generating own questions and views about the subject being taught.

4.2.2.3 Literature search lesson presentation method

The majority of respondents from all levels were not in favour of the literature search method: 65 (89%) level 2 respondents, 84 (94%) level 3 respondents and 77 (87%) level 4 respondents were opposed to this method, while less than 15% of respondents across all levels were in favour of this method. Literature search is a method that encourages active student participation in own learning and also improves critical thinking skills in line with a student-centred 21st century approach to teaching and learning. Level 2 respondents used tablets instead of hard copy textbooks; however, they still did not prefer the literature review method, which would require usage of the tablets and internet access. Henry and Gibson-Howell (2011:230) view undergraduate students in the 21st century as being a connected generation. On the contrary, the results of this study show that respondents were not always connected while at the institution, evidenced by not being in favour of literature search as a teaching method, even though they were constantly using their technological devices.

This supports the cry of the respondents at the NEI under study for free access to Wi-Fi technology so that they can easily browse the internet in search of literature. Most respondents cited expensive data as one of the challenges that resulted in them not being able to use their technological devices in class

to search for information. This confirms why this specific teaching strategy was not popular among the respondents at the NEI under study.

4.2.2.4 Group discussion lesson presentation method

Group discussions were the second most used presentation method, with 56 (63%) of respondents from level 4 using the method, while 33 (37%) did not prefer the method. Of level 3 respondents, 36 (40%) preferred this method, and of level 2 respondents, 35 (48%) preferred this method of lesson presentation, as it is easy to learn from peers, involves active participation and allows sharing of viewpoints freely without fear of victimisation.

Battersby (2017:119) is of the opinion that 21st century students' childhood extracurricular activities were team-orientated, which explains why students are good at group work. Students can access their smartphones to search for information that is not in their textbooks to get more clarity on the topic. Hills, et al (2017:2) and Henry and Gibson-Howell (2011:230) found that, although 21st century students enjoy teamwork and prefer group work due to their global connectivity and experiences of gaming, they prefer selecting their own group members rather than being allocated, which supports the results of this study which show that group discussion was a preferred teaching method.

Bruce and Klopper (2017:274) concur that group discussion is a valuable teaching strategy, especially for more senior students, as the emphasis is on active student participation and exchange of ideas. In addition, group work encourages critical thinking and active participation in a less threatening environment.

4.2.2.5 Discussion board lesson presentation method

The discussion board presentation method was the most unpopular method among level 2 (n=71, 97%), level 3 (n=86, 97%) and level 4 (n=87, 98%) respondents. The results revealed that respondents who were given tablets (level 2) were also unable to use discussion boards. Discussion boards can only be used online, meaning that respondents from level 2 had to utilise either their own data or Tshwane Free Wi-Fi to connect to the internet and access the discussion boards, as the NEI does not offer a free Wi-Fi connection to students. Hlatshaneni (2017:1) attests to the fact that the cost factor of data poses a challenge in South Africa.

Chou (2012:25) states that collaborative online learning promotes social interaction between students and the nurse educator. Students are more likely to utilise critical thinking when engaging in such discussions, and they are able to share learning experiences and sometimes reflections on their

learning. However, the results of this study do not support this fact, based on the high number of respondents from all levels who were not in favour of this method.

4.2.2.6 Other methods

Less than five percent respondents from level 2 and level 4 preferred other, unspecified, methods of lesson presentation in class, while more than 95% respondents from all levels did not indicate a preference for other methods other than the methods stated in the question.

4.2.2.7 Preferred methods of communication with nurse educator after hours

Respondents were requested to indicate their most preferred method of communicating with the nurse educator after hours. Respondents acknowledged the need to communicate with the nurse educator after hours.

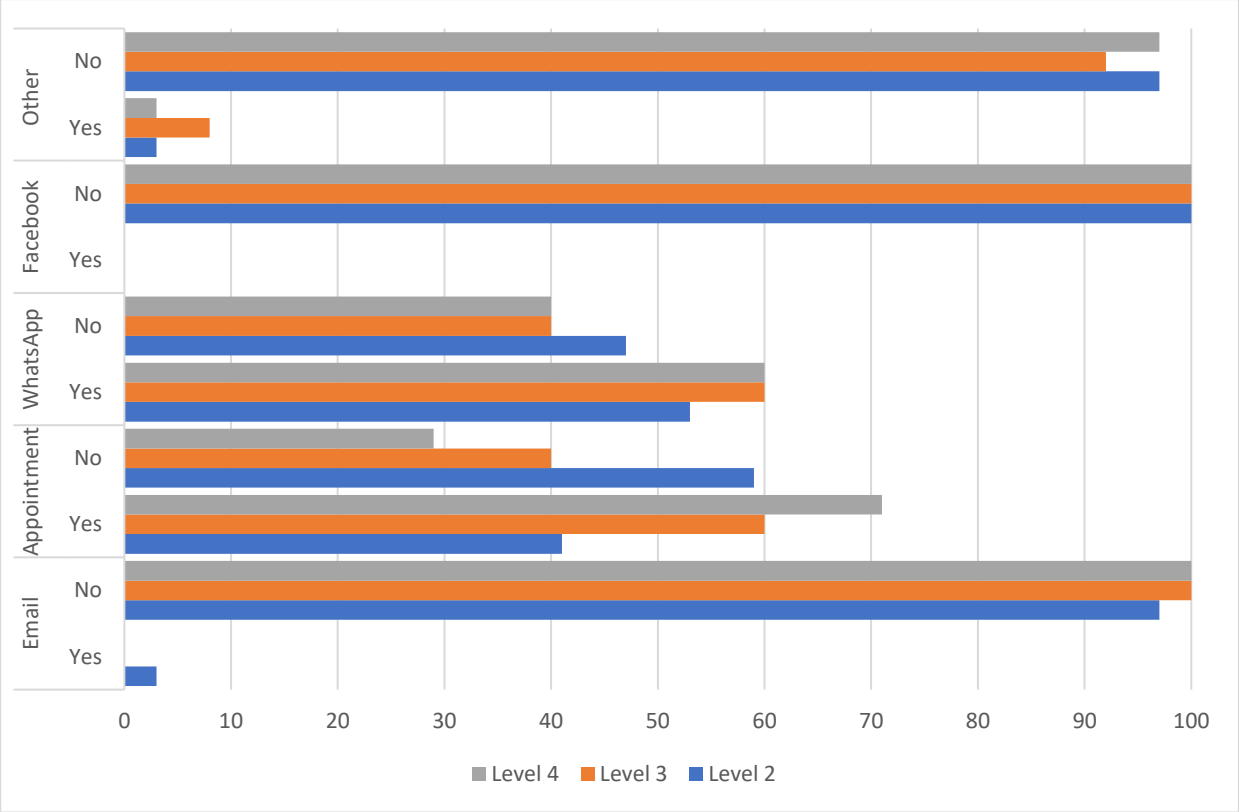

Figure 4.2: Preferred methods of communication with nurse educator after hours

Surprisingly, the study revealed that, despite the fact that undergraduate students are largely members of Generation Y who use technology almost daily, a huge percentage of respondents from level 2 (n=71, 97%), level 3 and level 4 (n=89, 100%), did not prefer email or Facebook to communicate with the nurse educator after hours. Instead, more than 50% of respondents across all levels preferred using

WhatsApp. Some students (>40%) across the levels still preferred face-face contact, with the percentage of level 2 respondents (n=30, 41%) who preferred this being lower than those of level 3 (n=53, 60%) and level 4 (n=63, 71%). According to Chicca and Shellenbarger (2018:183), most Generation Y students prefer texting via social media platforms such as WhatsApp, as it is quick and cost effective in comparison to emails and Facebook, which may be slow and unresponsive at times. In South Africa, data can be very expensive; however, some mobile companies offer special deals with cell phone contracts and sell data bundles at a very low cost for WhatsApp text messages, which supports WhatsApp as the preferred communication method after hours.

4.2.2.8 Ownership of a technological device

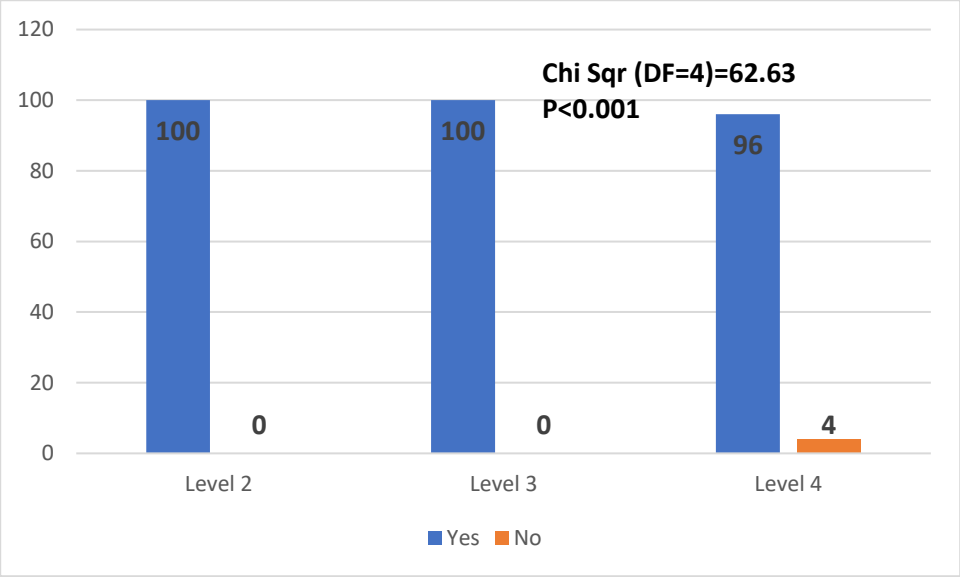

Figure 4.3: Ownership of a technological device (Smartphone, iPad, laptop)

The results in Figure 3 indicate that there was a significant association between respondents who owned a technological device and the study levels, with X^2 (4, N = 251) = 62.63, p<0.001. A total of 73 (100%) level 2, 89 (100%) level 3 and 85 (96%) level 4 respondents indicated that they owned a technological device – either a smartphone, iPad/tablet or a laptop. This may imply that using a technological device in learning would not be a challenge if only the nurse educators encouraged use of these technological means to enhance learning, which is contrary to the current practice at the NEI under study. Hart (2017:254) and Henry and Gibson-Howell (2011:230) state that Generation Y undergraduate students grew up with technological devices from early childhood and use technology to communicate with the outside world. This confirms the results of the study that most respondents, if not all, did own a technological device. However, the device should have features to enable browsing and multimedia texting (WhatsApp).

4.2.2.9 Posting of videos and comments on Facebook

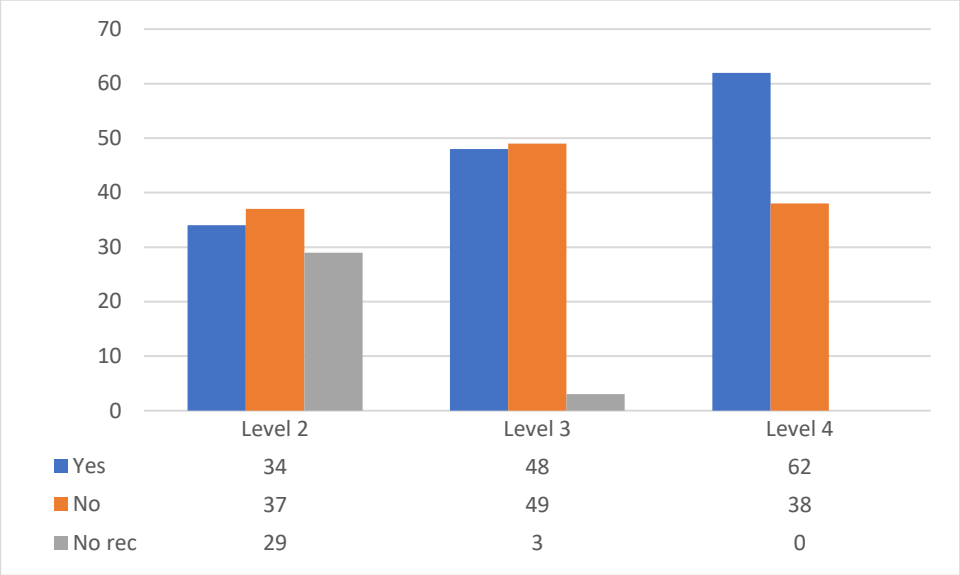

Figure 4.4: Posting of videos and comments on Facebook

The results of the study revealed that 35 (34%) respondents from level 2 posted videos and comments on Facebook, compared to 43 (48%) respondents from level 3. Level 4 respondents were the most active on Facebook, evidenced by 55 (62%) posting videos and comments there. This could be due to the fact that level 4 respondents had less course content than level 2 and level 3 respondents, meaning that they had more time available to spend on Facebook. Additionally, Facebook has been in use for a longer period than other forms of social media that may be used more frequently by most younger respondents, such as WhatsApp and Twitter (Alhabash and Ma 2017:9).

According to Qwerty (2017), statistics show that Facebook is one of most loved social media platforms in South Africa, with an overall percentage of 49% out of 15 million users of social media in the South African population using Facebook. Contrary to these statistics, the results of this study revealed that undergraduate respondents at the NEI under study were not actively utilising some of the features of Facebook in their interaction with the world. This could be a result of affordability of data, as the NEI where the study was conducted does not offer students free Wi-Fi, which could be a limiting factor in the respondents' activities on the internet.

Barnable, Cunning and Parcon (2018:28), in their study on the use of Facebook among nursing students, found that students used Facebook for both personal and academic reasons. The authors also gave contradictory evidence that some unethical behaviours, which may be deemed unprofessional, did occur with the use of Facebook by nursing students. Also, most students in their study reported that they had, at one stage or another, posted negative comments about colleagues and

sometimes unprofessional material as well. The researcher therefore assumes that fear of privacy settings being tampered with could be a reason for not posting comments and videos on Facebook by the respondents.

4.2.2.10 Microsoft lessons at the institution

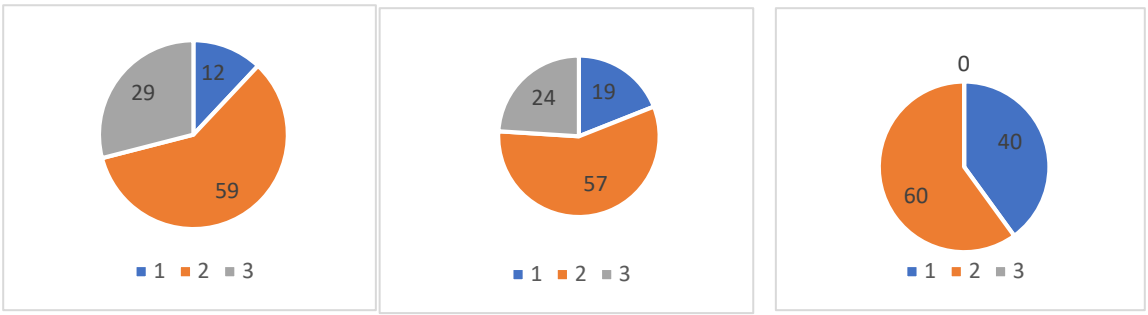

Figure 4.5: Microsoft Office lessons offered by the Nursing Education Institution

The respondents were requested to indicate whether the NEI they were enrolled in offered computer lessons in Microsoft Office. More than 50% of respondents at all levels indicated that their institution did not offer any computer lessons. Surprisingly, 62 (25%) out of 251 indicated that they had been offered computer lessons in Microsoft Office at the NEI under study – nine (12%) level 2 respondents, 17 (19%) level 3 respondents and 36 (40%) level 4 respondents indicated this. These results indicate some inconsistency in responses because, if lessons were offered at the institution, this would apply to all students. However, the lessons are offered upon request by the student, and some students may not have utilised the opportunity during their first year of training. Wahoush and Banfield (2014:209, 212), in their study on the use of information search online by undergraduate and qualified nurses, found that one of the challenges was poor computer literacy skills, which resulted in some qualified nurses preferring print or hard copies to online searches.

a) Frequency of Microsoft Office lessons

Table 4.3: Frequency of Microsoft Office lessons offered by the Institution

How often does the institution offer MS Office lessons	1st year	Daily	Library	Once a week	Weekly	When needed	No information recorded
Level 2	1 (1%)	2 (3%)	0 (0%)	6 (8%)	0 (0%)	0 (0%)	64 (88%)
Level 3	0 (0%)	74 (83%)	0 (0%)	5 (6%)	7 (8%)	2 (2%)	1 (1%)
Level 4	16 (18%)	3 (3%)	3 (3%)	1 (1%)	2 (2%)	7 (8%)	57 (64%)

The figure above illustrates the frequency of Microsoft Office lessons received to test whether respondents were all computer literate or not, especially during first year of training.

Eighty-three percent (n=74) of respondents from level 3 indicated that their institution offered Microsoft Office lessons on a daily basis, followed by 16 (18%) respondents from level 4 who said that computer lessons were offered during first year of training. Surprisingly, most respondents from level 4 (n=57, 64%) and level 2 (n=64, 88%) were not fair in responding as they did not record their responses. A few respondents (<10%) from all levels indicated that lessons were offered weekly at the library upon request.

Chipps, Brysiewicz and Walters (2015:72) report that insufficient infrastructure and resources, and poor access to computers and the internet are some contributory factors to the use of technological means in teaching and learning of students. This is evident in the results of this study, in that the institution under study has inadequate capacity to train undergraduate students in computer literacy.

b) Area where computer training was offered

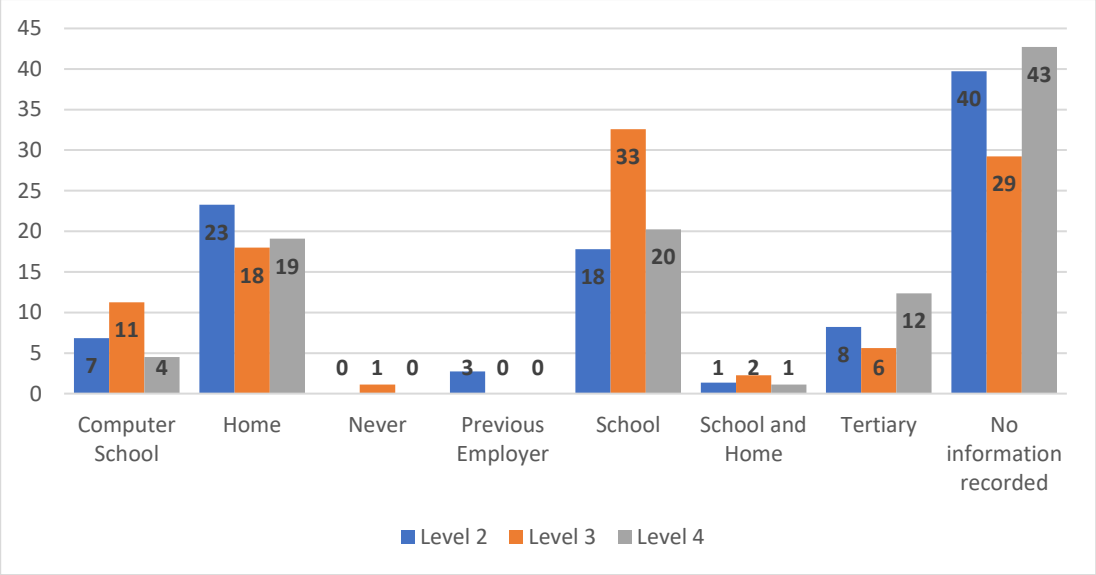

Figure 4.6: Previous computer training facility

The respondents were requested to indicate previous computer training facilities that had offered them computer literacy courses prior to commencing training, to establish whether they had been computer literate before commencing training or whether they only received initial training at the NEI. Most respondents received computer training while still at school: level 2: 18% (n=13), level 3: 33% (n=29) and level 4: 20% (n=18). Respondents who received home training from parents, siblings and others self- taught were as follows: level 2: 23% (n=17), level 3: 18% (n=16) and level 4: 19% (n=17).

Some respondents reported to have received formal training from a computer school prior to commencing training at the NEI where the study was conducted: five (7%) level 2 respondents, 10 (11%) level 3 respondents and four (4%) level 4 respondents. The study revealed that most respondents had some form of previous computer literacy training – perhaps some only had basic training and others advanced training. The results could indicate that use of technological means in teaching and learning would not pose a challenge to students and nurse educators, as basic computer literacy was achieved by most respondents. A large number (n>25 and >25%) of respondents across all levels did not record their responses about their previous computer training.

This finding implies and also concurs with literature on Generation Y students (Hugo and Fakude 2016:7) which indicates that students are technologically orientated and expect the institution and nurse educators to teach in consideration of their expectations and capabilities (Reilley 2012:4). These students would happily welcome the use of technological means in their teaching and learning. On the contrary, Ng'ambi, Bron, Bozalek, Gachago and Wood (2016:850), in their study in South African higher education institutions, found that although access to technological devices is increasing among 21st century students, a small number of students still enter institutions of higher learning with inadequate access to information and technology and basic computer literacy skills, and some students still experience challenges in learning new academic skills to engage in a digital world.

c) Funding for previous computer training

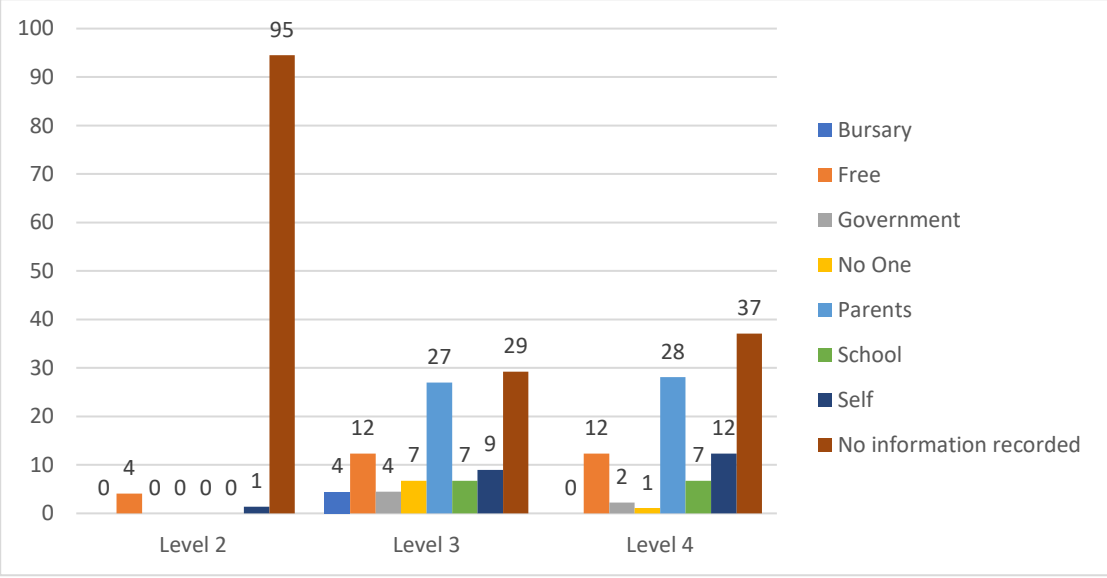

Figure 4.7: Funding for previous computer lessons received

Figure 7 illustrates funding for respondents' computer lessons received prior to commencement of training. More than 25% (n>23) of respondents from level 3 and level 4 received funding for previous

computer training from their parents, while less than 10% from the same levels received funding from bursaries, government or school. More than 28% of respondents did not indicate where their funding came from; however, the results indicate that nine percent to 12% of level 3 and level 4 respondents were self-funded or attended the lessons for free. The highest percentage of respondents (n=69, 95%) from level 2 did not indicate where they got funding for their computer lessons. The results could imply that some respondents may have been from disadvantaged backgrounds and could not afford the related costs of computer training. In addition, respondents were admitted for training in the NEI not being fully prepared for the 21st century technology era despite the fact that they owned technological devices.

The results in this study concur with results of other studies on 21st century undergraduate students which show that students grew up using technology and thus use it daily to communicate and interact with their spheres of contact (Henry and Gibson- Howell 2011:230; Hugo and Fakude 2016:7). Also, in South Africa, there are many government-funded initiatives to offer free computer literacy to students to prepare them for the workplace, especially in schools; however, these resources may not be known by most respondents and may be under-utilised (Molefe 2016).

4.2.2.11 Wi-Fi access at the institution

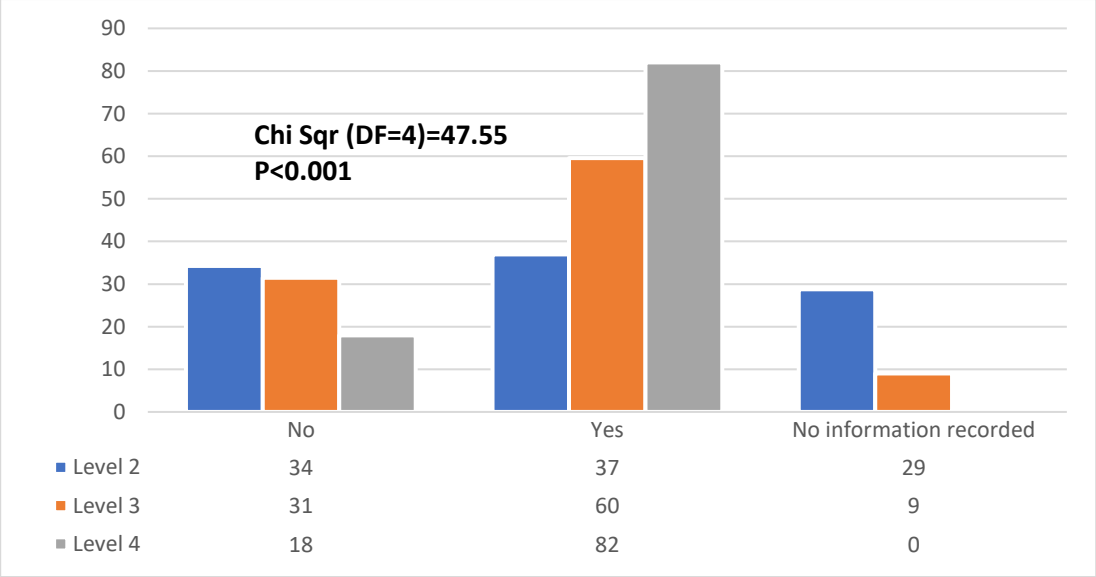

Figure 4.8: Access to Wi-Fi at the institution

The respondents were requested to indicate whether the NEI had access to Wi-Fi technology other than Tshwane Free Wi-Fi, which is accessed from specific access points at the NEI. There was a highly significant difference ($p<0.001$) between respondents from all levels who indicated that their institution had access to technology that is Wi-Fi enabled, with level 4 having the highest number at 73 (82%),

followed by level 3 (n=53,60%) and level 2 (n=27,37%), giving a X^2 of 47.55. More than 30% of respondents from level 2 and level 3 indicated that their institution did not have access to technology that is Wi-Fi enabled.

The results from this study might be conflicting in the sense that students can access Tshwane Free Wi-Fi from specific access points at the institution, although the bandwidth is poor and occasionally there would be no access at all (Geerdts, Gillwards and Callandro 2016:3). Students referred to this Wi-Fi access and not to the institution's Wi-Fi, to which they do not have access as it is limited to the library and academic staff offices only, not available to students. In a study done in Kenyan universities on technology-enhanced learning, Cunningham (2016:31) states that institutions' networks, both wired and wireless, need to be further expanded to cope with the numbers of students and the diversities of devices they use. Adequate internet access (Wi-Fi access) is a necessary tool to support newer teaching and learning strategies, in line with 21st century teaching and learning (Mtebe and Raisamo 2014:54).

4.2.2.12 Access to internet-linked resources at the institution

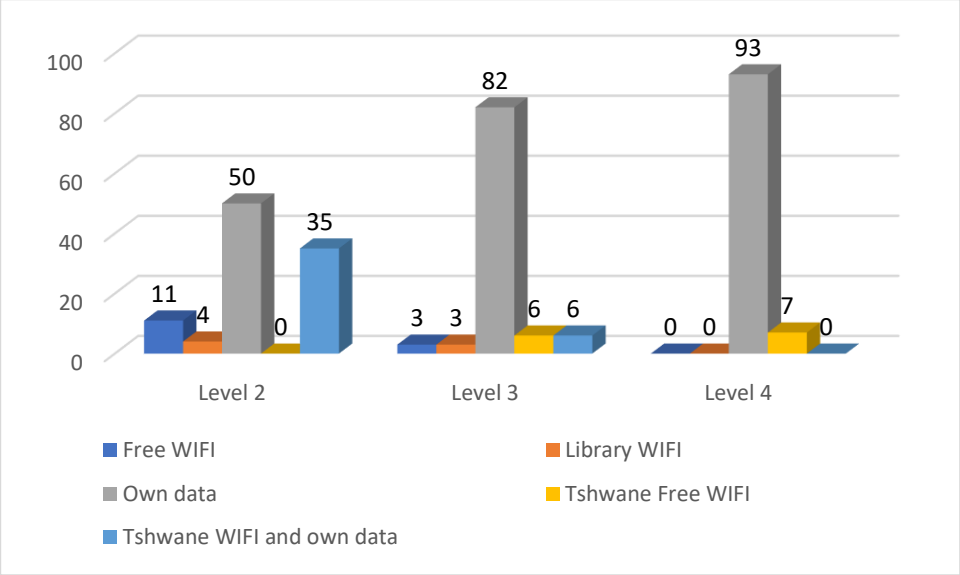

Figure 4.9: Access to internet linked resources at the institution

Respondents were requested to indicate how they accessed internet-linked resources while at the NEI. Most respondents across all levels (>49%) usually accessed internet linked resources using own data on their smart devices, while approximately 35% of level 2 students utilised Tshwane Free Wi-Fi to access internet linked resources. Only a small percentage (<5%) of respondents across all levels accessed the internet from the library computers located at the NEI. Reliance on the institution' computer labs is slowly diminishing due to poor management at times, as well as due to 21st century students

bringing their technological devices into class. Access to internet-linked resources using Wi-Fi is imperative in NEIs in this technological era.

Ng'ambi, et al (2016:850) state that institutions of higher learning should accommodate 21st century students in this technological era, as they have a need to use technological tools for communication, learning and access to information through literature searches, to improve learning. Most social networking applications, which are user-driven, are increasingly use for pedagogical purposes as well, to enhance teaching and learning.

4.2.3 Section B: Teaching strategies/methods used by nurse educators

4.2.3.1 Preferred teaching method

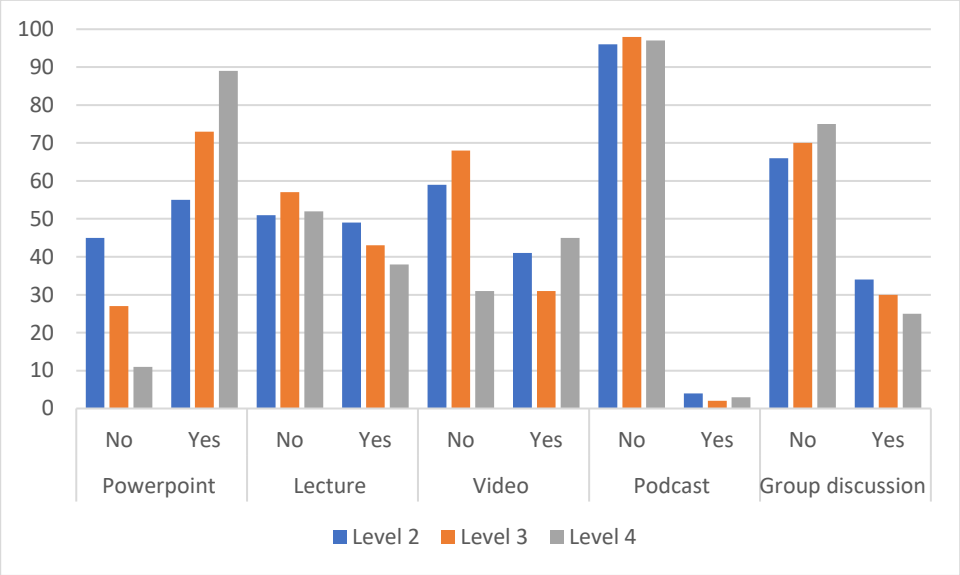

Figure 4.10: Preferred teaching method

This figure illustrates respondents' preferences regarding teaching methods used in class. Respondents were presented with five different teaching methods to choose from and results show a high preference for PowerPoint presentation (>50%) across all levels of respondents. According to Furst (2011:4), most Generation Y students prefer PowerPoint lessons as they help aid concentration and promote student engagement, and it is easy to learn from the summary of content presented.

Less than 50% of all respondents across level 2 to level 4 preferred the lecture method, which is the predominantly used teaching method at the NEI where the study was conducted. These results show that undergraduate students, as ubiquitous technology users, would like to see other technological means of teaching and learning being utilised, as the traditional lecture method does not often encourage active student participation but usually involves a regurgitation of information from a lecturer

to a student. Active learning and critical thinking skills are not fully activated by this method of teaching (Hugo and Fakude 2016:x).

Podcasts were not preferred as a teaching method, as indicated by more than 95% of all levels of respondents. This could be due to this method not being utilised at all at the NEI where the study was conducted, meaning that most students were not conversant enough with the method to be able to evaluate it. Hugo and Fakude (2016:xi) are of the view that the use of media and technology by the nurse educator or the institution is determined by what is known about it and what both the institution and the nurse educator believe it to be capable of doing. Sahim, Cavlazoglu and Zettuncu (2015:32), in their study on the effectiveness of podcasts in teaching and learning in Iran, found that students preferred podcasts as a revision tool and found them more effective for learning than textbooks. Furthermore, students preferred podcasts as innovative teaching and learning means compared to traditional lecture methods.

Video presentation was ranked third in order of preference (>30%) for levels 2 and 3, but not for level 4, which had 45% for video presentation and 38% for the lecture method. This could be stemming from the fact that the NEI under study does not have Wi-Fi access for students to access video lectures online to be viewed later in their own free time.

Battersby (2017:121) states that the addition of creative teaching strategies such as videos help to clarify confusing concepts, as students learn best by observing and generating their own questions and views about the subject being taught. Pardo, Mirriahi, Dawson, Zhao, Zhao and Gasevic (2015:1-2) are of the view that using videos in teaching ensures that minimal face to-face time is spent on more collaborative activities in class. By flipping the classroom, students could view the recorded videos later, explore more course material and apply their understanding, thus promoting active student participation.

Data from the study reveal that group discussion as a teaching method was also not preferred among all levels of respondents, as less than 35% respondents across levels 2 to 4 preferred this method of presentation. This implies that, although undergraduate students in the 21st century prefer collaboration and communication and are active participants in learning, they prefer collaborating on social platforms on their own terms, perhaps outside class, but not so much in a formal classroom setup, as indicated by Henry and Gibson-Howell (2011:230). The authors are of the view that, although 21st century students enjoy teamwork and prefer group work due to their global connectivity and experiences of gaming, they prefer selecting their own group members rather than being allocated group members, which supports the results of this study. Sometimes, students may not be at liberty to pick their own group members as, for certain group activities, the nurse educator may have to assign members to a group and let students choose a group leader.

4.2.3.2 Reasons for choice of preferred teaching method using technological means

The researcher was not only interested in finding out which teaching methods respondents preferred in class but also in the reasons for their preferences, including possible suggestions about improvements on the preferred methods using technological means.

Table 4.4: Reasons for preference of teaching methods using technological means

		Reason for preference				
Preferred teaching method		**Easy to learn**	**Summary**	**Easy to learn and summary**	**Student engagement**	**Not recorded**
PowerPoint	Level 2	14 (20%)	7 (10%)	10 (14%)	6 (8%)	34 (48%)
	Level 3	13 (15%)	8 (9%)	17 (19%)	1 (1%)	50 (56%)
	Level 4	29 (33%)	3 (3%)	40 (45%)	5 (6%)	12 (13%)
Lecture	Level 2	10 (14%)	1 (1%)	12 (16%)	5 (7%)	43 (61%)
	Level 3	6 (7%)	0 (0%)	11 (12%)	14 (16%)	57 (64%)
	Level 4	14 (18%)	0 (0%)	17 (19%)	12 (13%)	46 (52%)
Video	Level 2	15 (21%)	0 (0%)	5 (7%)	7 (10%)	46 (63%)
	Level 3	10 (11%)	0 (0%)	13 (15%)	0 (0%)	66 (74%)
	Level 4	15 (17%)	0 (0%)	23 (26%)	0 (0%)	51 (57%)
Podcast	Level 2	3 (4%)	0 (0%)	1 (1%)	0 (0%)	69 (95%)
	Level 3	1 (1%)	0 (0%)	0 (0%)	0 (0%)	88 (99%)
	Level 4	1 (1%)	0 (0%)	2 (2%)	0 (0%)	86 (97%)
Group discussion	Level 2	13 (18%)	0 (0%)	4 (5%)	6 (8%)	50 (69%)
	Level 3	2 (2%)	0 (0%)	5 (6%)	9 (10%)	73 (82%)
	Level 4	6 (7%)	0 (0%)	0 (0%)	20 (22%)	63 (71%)

The above table illustrates reasons for respondents for preferring PowerPoint as teaching medium in class, and their suggestions for improvement of these teaching methods below.

The significant results of this study are that respondents from level 2 (n=14, 20%), level 3 (n=13, 15%) and level 4 (n=29, 33%) found PowerPoint preferable because it makes it easy to learn and provides a summary of the lesson content (Bruce and Klopper 2017:300). The use of PowerPoint as a teaching medium increases students' memorising ability and understanding (Shan and Khan 2015:350; Shah, Patel and Shah 2017:41). More than 20% of respondents in level 4 preferred group discussion as it encouraged active student engagement, while 13% of respondents in level 4 and 16% of respondents in level 3 preferred the lecture method as it was regarded by respondents to also encourage active participation of students.

Sewasew, Mengestle and Abate (2015:234) state that PowerPoint presentations can be perceived by some students as less effort being put in the lesson by the nurse educator. Shah, et al (2017:41) state that the use of PowerPoint presentations provides students with a different atmosphere for learning.

4.2.3.3 Suggestions for improvements

a) PowerPoint lessons improvements

Table 4.5: Suggestions on possible improvements of PowerPoint lesson presentation

Suggestion for PowerPoint improvements	Level 2	Level 3	Level 4
To give more information	9 (12%)	0 (0%)	1 (1%)
To use more PowerPoint presentations	0 (0%)	2 (2%)	0 (0%)
To use multimedia to share slides with learners	8 (11%)	6 (7%)	7 (8%)
Allow students to take notes	1 (1%)	0 (0%)	7 (8%)
To make slides clear and visible	4 (5%)	8 (9%)	20 (23%)
To make learning easier	2 (3%)	0 (0%)	1 (1%)
To service and upgrade projectors	0 (0%)	6 (7%)	1 (1%)
To save time by summarising slides	0 (0%)	14 (15%)	2 (2%)
No need to improve	1 (1%)	5 (6%)	2 (2%)
Not recorded	48 (67%)	48 (54%)	48 (54%)

Respondents gave suggestions for improvement of PowerPoint presentations. As illustrated in the table above, 20 (23%) respondents from level 4 stated that presentation slides should be clear and visible, while nine (12%) respondents from level 2 stated that presentation slides should give more information and 14 (15%) respondents from level 3 stated that nurse educators should save time by writing just a summary of content to be taught on the slides rather than a lot of points. More than half of respondents across all levels did not record their responses.

The results from the study indicate that PowerPoint lesson presentations are indeed the most commonly used among all other teaching methods. Nurse educators have not yet explored other technological means of teaching in line with 21st century teaching. The results also imply that respondents were still used to the old model, the lecture method, as a PowerPoint lesson is a projection of slides of a lecture – a one-way teaching method where the nurse educator is the only one with information and knowledge and students sit on the receiving end. Eight (11%) respondents in level 2 stated that slides should be shared between the nurse educator and respondents, using multimedia methods and online applications like WhatsApp and Facebook.

Respondents did not show any self-directedness in their own learning, evident in suggestions for clearer and bigger slides so that note-taking could be easier. As PowerPoint lesson presentations are most commonly used at the NEI under study, respondents seemed not to have been exposed to newer, more modern teaching methods such as online discussion boards. Six (7%) respondents from level 3 stated that projectors used in classrooms should be serviced regularly, to avoid them stopping during the lesson (Yee, Sim, Ng, Low and Chong 2017:676).

Contrary to these results, Bruce and Klopper (2017:300) state that presentation slides should not have a lot of information, but rather bulleted points, with no more than five points per slide. Slides consisting of long paragraphs of text are not conducive for learning and are not evidence of best practice (Hugo and Fakude 2016:292).

Rambe and Nel (2013:418) concur that nurse educators should utilise conversational technological means such as WhatsApp and Facebook to communicate information with students, to demonstrate the academic relevance of these methods as they are 21st century communication tools utilised daily by undergraduate students.

b) Lecture method improvements

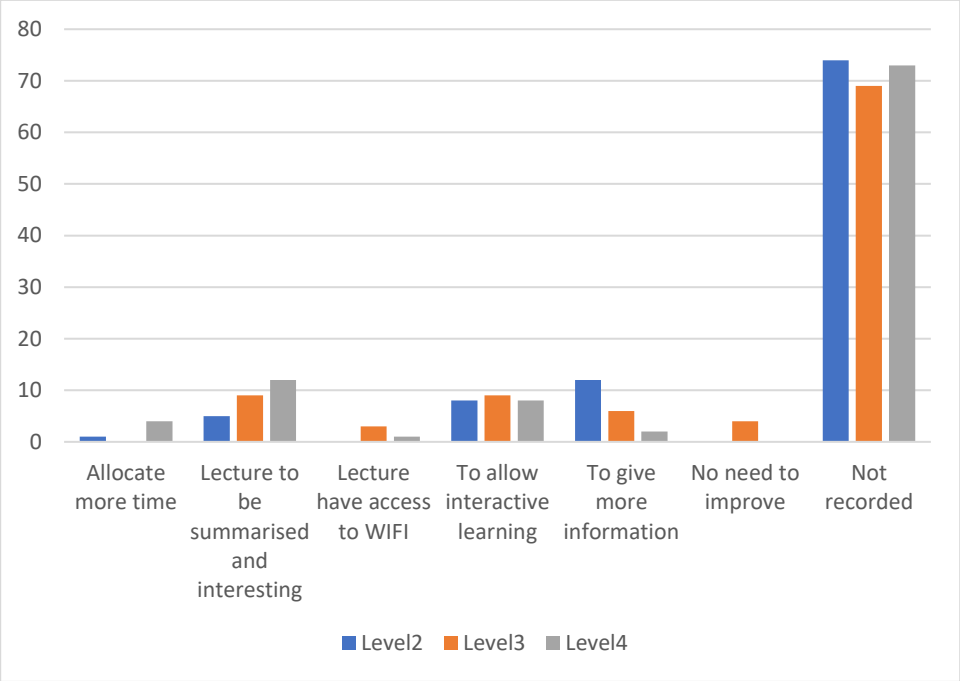

Figure 4.11: Lecture method suggestions

Respondents were requested to indicate their preference for lectures as teaching method and to give possible suggestions for improvements, as illustrated in the figure above. More than 65% of respondents across all levels did not suggest anything about the lecture method, while a smaller percentage (<15%) across all levels gave suggestions on how to improve the lecture method. The suggestions included respondents indicating that the lecture should be summarised, be interesting, give more information and be allocated more time. They also suggested that lecture halls should have access to Wi-Fi. The results concur with literature on 21st century teaching and learning that most nurse educators in NEIs are still using traditional teaching methods for 21st century students who use technological means daily in their lives but are not encouraged to use them in class or for learning purposes.

Howard, Meehan and Parnell (2018:531-533) are of the opinion that students' choice of teaching method may be affected by the nurse educator's personality or teaching style, personal learning styles of students, study habits and esteem for the lecturer.

Additionally, the study results do not portray a true picture of the utilisation of the lecture method at the NEI being studied, as this method is still the most utilised teaching method to which respondents are exposed at the stated institution. The reason for these results could be due to the fact that respondents at the institution under study were not exposed to other innovative teaching methods utilised in the 21st century, such as flipped classrooms, blended learning and blogs, due to infrastructure, budget constraints and limited technological competency of the nurse educators (Ng'ambi, et al 2016:845).

c) Video method improvements

Table 4.6: Video method suggestions

Suggestions for video	Level 2	Level 3	Level 4
To allow active participation	1 (1%)	3 (3%)	5 (4%)
To combine with other methods	2 (3%)	1 (1%)	0 (0%)
To be effective	4 (5%)	2 (2%)	6 (7%)
To share videos with learners	7 (10%)	0 (0%)	2 (2%)
To have WIFI access	2 (3%)	1 (1%)	0 (0%)
To be beneficial	0 (0%)	0 (0%)	3 (3%)
To be used more often	0 (0%)	16 (18%)	6 (7%)
No need to improve	1 (1%)	3 (3%)	1 (1%)
Not recorded	65 (77%)	63 (72%)	67 (76%)

The suggestions from the respondents on possible improvements to the video method were indicative of the fact that this teaching method is the least used at the NEI under study. Most respondents (>70%) did not record their suggestions, from which it could be interpreted that they had no basis on which to evaluate the effectiveness and give suggestions.

Only a few respondents from level 3 (n=16, 18%) suggested that video method should be used more often in class, and seven (10%) level 2 respondents suggested that videos be shared with students on social media platforms such as WhatsApp, Facebook and blogs, which are some of the technological means utilised by 21st century students, but are not currently being utilised at the institution under study. Henderson, Selwyn and Aston (2015:1570), in a study conducted in Australia among university students, found that one of the preferred teaching and learning methods by students was video-recorded lectures, as students could repeat and review the recordings.

Hugo and Fakude (2016:216) state that 21st century students have specific expectations from their nurse educators in terms of instructional strategies, and therefore an analysis of the media profile of

students should be done before determining teaching strategies to be utilised in class. Infrastructure and support are also needed from the institution. According to Howard, et al (2018:533), most students tend to prefer video lesson presentation for improved understanding, owing to the ability to replay the video as many times as they need to, in order to compensate for missed parts of the lesson and difficult material, and for better understanding.

d) Podcast method improvements

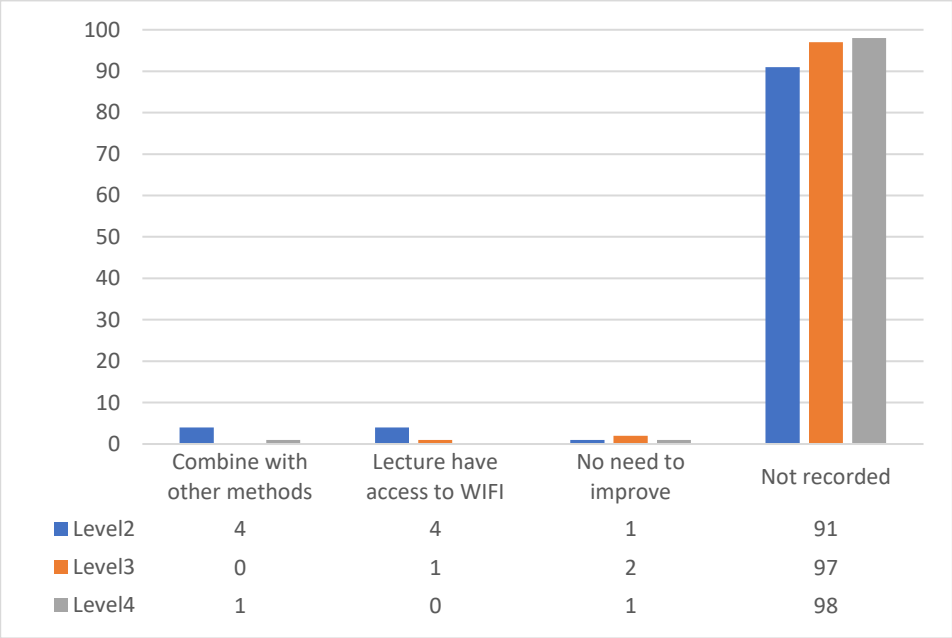

Figure 4.12: Podcast improvements

The results reveal that less than five percent of respondents from all levels suggested that the podcast method be combined with other teaching methods, while others (4%) were of the opinion that the lecture hall should have access to Wi-Fi. More than 90% of respondents across all levels did not give their suggestions. The results could possibly mean that podcasting is not a commonly utilised teaching method at the NEI under study, and since there is no Wi-Fi access in classrooms, it is a challenge to utilise this method of teaching.

Bruce and Klopper (2017:302) state that creating podcast content can be time-consuming and hard work on the part of nurse educator, and it requires technological equipment and software that the NEI under study may not possess. In addition, Bruce and Klopper (2017:303) also state that podcasting is an exciting way to ensure active student participation in their own learning, as they will have to engage with the podcasts and prepare for the next contact session with the nurse educator. Additionally, students can submit their own podcast assignments, ensuring quality assignments as the podcasts could be viewed by other listeners through free podcast directories.

e) Group discussions improvements

Table 4.7: Suggestions for group discussion

Suggestion for group discussion	Level 2	Level 3	Level 4
To be allowed after sessions	7 (10%)	4 (4%)	10 (11%)
To form manageable groups	4 (5%)	8 (9%)	3 (3%)
They are not effective	0 (0%)	0 (0%)	3 (3%)
They are important for sharing points of view	0 (0%)	3 (3%)	0 (0%)
No need to improve	2 (3%)	3 (3%)	1 (1%)
Not recorded	60 (82%)	71 (81%)	72 (82%)

The respondents were instructed to give suggestions on how to improve group discussions. Less than 10% of all respondents across all levels indicated that groups should consist of a manageable number of students (Bruce and Klopper 2017:274), and should be allowed only after the lesson has been given. Only level 3 respondents (n=3, 3%) stated that groups were important for sharing information and so they should continue.

Findings from the literature about group discussions utilised by 21st century students indicate that students prefer smaller groups to which they assign membership themselves. On the contrary, the above results show that respondents at the NEI under study were still used to the traditional teaching method where students are passive participants. The suggestion that groups be conducted after lessons indicates that a student-centred approach is not encouraged at this institution, so the teaching and learning is not in line with that of the 21st century, for millennial students.

Li, Zheng, Tang and Sang (2015:476) assert that small-group discussions are a useful teaching strategy promoting active learning as students incorporate critical thinking skills and behaviour, and acquire abilities for independent problem-solving. Surprisingly, 80% of respondents in this study did not give suggestions on possible improvements, while the group discussion method is also the most commonly used teaching method at the institution under study. According to Chicca and Shellenbarger (2018:183), undergraduate students in the 21st century may be lacking in basic social skills and communication skills sometimes, due to the amount of time they spend engaging with their devices. However, not being allowed to engage with the devices for learning purposes can be frustrating to millennial undergraduate students.

4.2.3.4 Opportunities and benefits of using smart device in learning

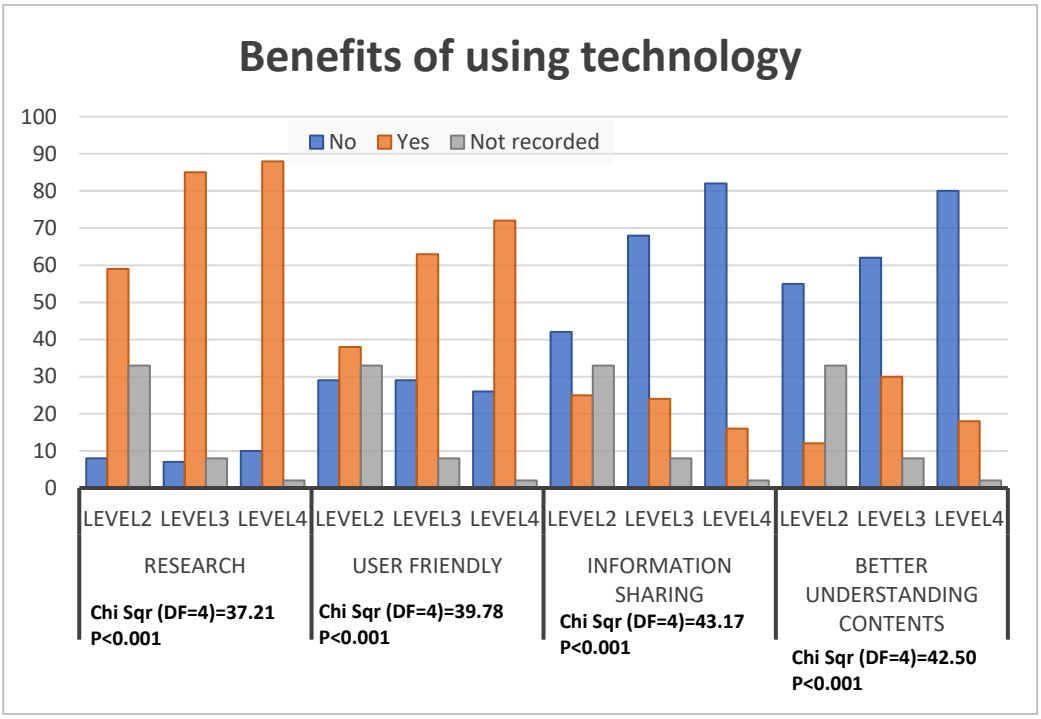

Figure 4.13: Illustration of benefits of using smart devices in learning

Respondents were requested to state the opportunities or benefits of using their smart devices in learning. The results indicate that more than 55% of respondents across all levels agreed that smart devices helped them with research for additional information when allowed to use these devices in class. The results also show that there was a highly significant difference ($p<0.001$) between the respondents across all levels who said that technology is beneficial in doing research as compared to respondents who said is not helpful (X^2 (4, N = 251) = 37.21). Similarly, the difference between respondents who said their smart devices were user-friendly and those who said they were not user-friendly was also significant, with $X^2(4, N = 251) = 39.78$, $p<0.001$. This is evident from the high percentage of respondents (72% in level 4, 63% in level 3 and 38% in level 2) who stated that smart devices were user-friendly and portable.

Respondents across all levels were not in favour of using their smart devices for sharing information during lessons, as evidenced by high percentages (42%, 69% and 82% of level 2, level 3 and level 4 respectively) of respondents who were not in favour of this, as compared to <25% of respondents who were in favour of using their smart devices (X^2 (4, N = 251) = 43.17, $p<0.001$). This could possibly be due to lack of Wi-Fi availability at the institution under study and the high cost of data. The social media policy of the institution under study prohibits smart device use in class, unless directed to do so by the nurse educator, which could be the reason why respondents were not keen on device use in learning.

Henderson, et al (2015:1568) state that the use of technological means in teaching and learning differs according to age, level of training, subject area and institution. Similarly, there was a highly significant difference (X^2 (4, N = 251) = 42.50, p<0.001) between the respondents who were unable to use technological means for better understanding as compared to the respondents who were able to use their smart devices. Respondents from level 2 (n=40, 55%), level 3 (n=55, 62%) and level 4 with (n=71, 80%) indicated that the use of a technological device was not beneficial in enhancing understanding of the lesson content.

4.2.3.5 Barriers to using smart devices in class

Table 4.8: Illustration of barriers to using smart device in class

Barrier for using technology		Yes	No	Not recorded
Poor battery life	Level 2	25 (34%)	24 (33%)	24 (33%)
	Level 3	66 (74%)	13 (15%)	10 (11%)
	Level 4	75 (84%)	7 (8%)	7 (8%)
Device technical problems	Level 2	33 (45%)	16 (22%)	24 (33%)
	Level 3	69 (78%)	10 (11%)	10 (11%)
	Level 4	74 (83%)	8 (9%)	7 (8%)
Access to internet (data, Wi-Fi, etc.)	Level 2	27 (37%)	22 (30%)	24 (33%)
	Level 3	47 (53%)	22 (36%)	10 (11%)
	Level 4	59 (66%)	23 (26%)	7 (8%)
Distraction	Level 2	31 (42%)	18 (25%)	24 (33%)
	Level 3	49 (55%)	30 (34%)	10 (11%)
	Level 4	41 (46%)	41 (46%)	7 (8%)
Technology (Device) use timeslot	Level 2	47 (64%)	2 (3%)	24 (33%)
	Level 3	54 (61%)	25 (28%)	10 (11%)
	Level 4	61 (69%)	21 (24%)	7 (8%)
Loss of information and theft of devices	Level 2	47 (64%)	2 (3%)	24 (33%)
	Level 3	77 (87%)	22 (%)	10 (11%)
	Level 4	78 (88%)	4 (5%)	7 (8%)
Health reasons	Level 2	39 (53%)	10 (14%)	24 (33%)
	Level 3	78 (87%)	11 (%)	10 (11%)
	Level 4	81 (91%)	1 (1%)	7 (8%)

Respondents were instructed to indicate barriers they encountered in using their smart devices in class. The results indicate that a low percentage of respondents from level 2 identified poor battery life of their devices (n=25, 34%) and access to the internet (n=27, 37%) as barriers compared to respondents from level 3 and 4 (n>45, >50%). Surprisingly, respondents from level 3 and 4 were not in possession of tablets. Lack of technical support was a challenge, as cited by >40% respondents across all levels, and using devices during lessons was seen to be distracting the lesson. Time allocated for device use in class during the lesson, loss of information and theft of devices were also barriers across all levels

(n>45, >60%). Significantly, the highest percentage respondents across all levels indicated barriers due to health reasons, possibly due to all respondents owning a smart device and the usage of devices being very high. The study results indicate that, despite the advantages of technological means in teaching and learning, some untoward effects such health challenges could pose a challenge if device use is not controlled, especially during lessons. Poor battery life of devices poses a challenge, as the classrooms do not have charging ports that students can also utilise.

Oliveira, Goncalves, Martins and Branco (2018:954) state that nurse educators are competing for students' attention with Facebook, WhatsApp, Snapchat, Twitter, Instagram and other social media platforms, and therefore they need to entice students by utilising the above in academics. In addition, the above authors state that most undergraduate students in the 21st century lack soft skills in interacting with their elders, patients and relatives (Oliveira, et al 2018:955).

A high percentage (n=41, 46%) of level 4 respondents indicated distraction during lessons as a barrier compared to respondents in other levels. Perhaps, as senior students who are just about to complete their training, much more was expected of level 4 respondents in terms of professional development, and as such distractions during lessons could be regarded as unethical and disrespectful of the nurse educator, as the NEI's policy prohibits device usage during lessons unless indicated by the nurse educator. Level 3 respondents were the most affected by internet access (n=22, 36%) compared to level 2 and level 4 respondents, who also cited it as a barrier. A small percentage (>2%) of the respondents across all levels indicated that device theft was also a barrier to using devices in class.

4.2.3.6 Possible solutions to resolve barriers of using smart device in class

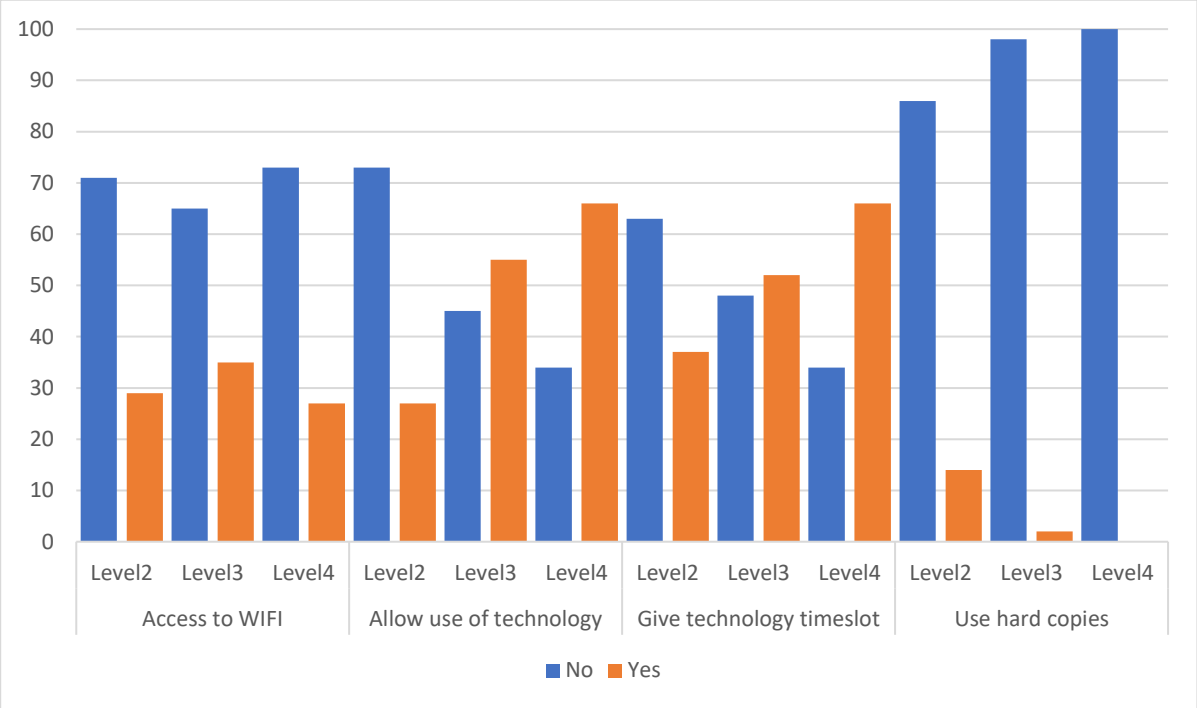

Figure 4.14: Possible solutions to resolve barriers

Respondents indicated possible solutions to resolve barriers for using their smart devices in class. Surprisingly, only 21 (29%) respondents from level 2, 31 (35%) from level 3 and 24 (27%) from level 4 indicated that they should have access to Wi-Fi at the NEI. More than 25% of respondents across all levels stated that they should have time allocated during lessons to use their smart devices for learning purposes, with the highest percentage (n=59, 66%) in level 4, followed by level 3 (n=49, 55%) and level 2 (n=20, 27%). It is surprising that not many respondents from all levels wanted to have Wi-Fi availability and use of smart devices in class, as these aspects were indicated to be a problem faced by respondents.

The results of this study are not consistent with other previous studies in the literature review on 21st century undergraduate students, as respondents concurred with the NEI's social media policy, which prohibits unauthorised smart device use in class. Hugo and Fakude (2016:194) are of the opinion that nurse educators should create an environment that is congruent with the life experiences of 21st century students.

More than 26% of respondents across all levels stated that nurse educators should allow students time to use their devices in class anytime. More than 80% of respondents across all levels indicated using hard copies would not be a possible solution to resolve the barrier of using technological device during

lessons. Only a small percentage (n=10, 14%) of level 2 and level 3 (n=2, 2%) respondents stated that they would rather use hard copies, while level 2 respondents were in possession of tablets. This could possibly be due to the challenges that the level 2 respondents encountered with downloading study material and with the general use of the tablets, which was a challenge initially (Bruce and Klopper 2017:311).

4.2.4 Section C: Teaching and learning in the classroom

4.2.4.1 Classroom environment

Table 4.9: Classroom environment

Class environment	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Information not recorded
Level 2	16 (22%)	27 (37%)	2 (3%)	3 (4%)	0 (0%)	25 (34%)
Level 3	23 (27%)	49 (55%)	7 (8%)	4 (4%)	4 (4%)	2 (2%)
Level 4	26 (29%)	54 (61%)	1 (1%)	5 (6%)	2 (2%)	1 (1%)

Respondents were asked to indicate whether the classroom environment promoted interactive, collaborative learning on a five-point Likert scale, ranging from strongly agree to strongly disagree (see Table 9).

Out of 251 respondents from all levels, more than 20% strongly agreed that the class environment promoted interactive and collaborative learning, while 35% respondents agreed, and a small percentage of respondents (<10%) were not sure. Less than seven percent of respondents disagreed with the fact that classroom environment had a positive effect to interactive and collaborative learning. Some respondents across all levels did not indicate their responses, with the highest percentage, at 34%, in level 2. These results could imply that the classroom environment can promote or hinder learning due to inability to concentrate. According to Toothaker (2018:80), a classroom environment where active learning strategies are utilised helps to engage students to be actively involved and collaborate with each other.

4.2.4.2 Expectations about learning

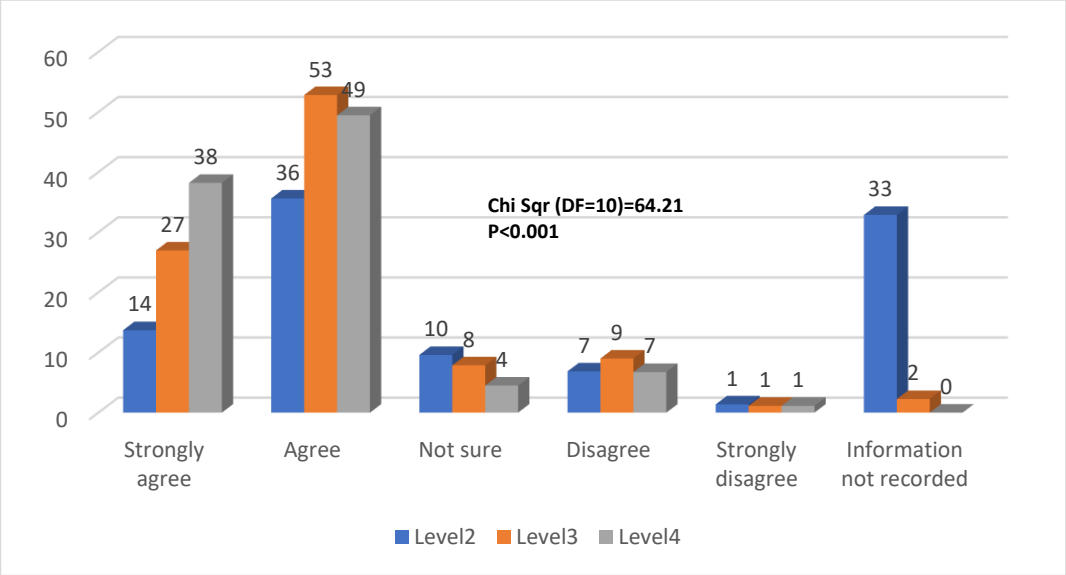

Figure 4.15: Expectations about learning

A significant number of respondents across all levels (between 13% and 53%) stated that the expectations about learning were discussed with students prior to teaching, compared to respondents who said that they were not sure (<11%) and those who disagreed (<10%), with X^2 (10, N = 251) = 64.21, p<0.001.

Of the 251 respondents, 10 (14%) level 2, 24 (27%) level 3 and 34 (38%) level 4 respondents strongly agreed that learning expectations were discussed and agreed upon before lessons commence, while 26 (36%) level 2, 47 (53%) level 3 and 44 (49%) level 4 respondents agreed with this statement. Seven (10%) respondents from level 2, seven (8%) from level 3 and four (4%) from level 4 were not sure whether expectations about learning were discussed. No more than 10% of respondents across all levels disagreed that learning expectations were discussed before lessons commence. Thirty-three percent of respondents from level 2 did not record their views.

These results indicate that nurse educators do discuss learning expectations and outcomes with the students at the start of the lesson, so that students can know what to expect, how to participate in the lesson and how to be actively involved.

Tharani, Husain and Warwick (2017:84) found that, when students cannot comprehend learning expectations from the nurse educator and from the NEI as a whole, for example, behaviour in class, body language, positive attitude and expected learning outcomes, their emotional well-being and learning are negatively affected.

4.2.4.3 Active participation encouraged in class

Table 4.10: Active participation encouraged in class

Active participation encouraged	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Information not recorded
Level 2	29 (40%)	19 (26%)	0 (0%)	1 (1%)	0 (0%)	24 (33%)
Level 3	52 (58%)	31 (35%)	1 (1%)	1 (1%)	2 (2%)	2 (2%)
Level 4	53 (60%)	34 (38%)	0 (0%)	0 (0%)	2 (2%)	0 (0%)

Of the total of 251 respondents, more than 40% across all levels strongly agreed that active participation of students was encouraged in class, while less than five percent of respondents across all levels were either not sure, disagreed or strongly disagreed that active participation of students in class was encouraged. The results of the study indicate evidence of implementation of active student participation, which is line with Carl Rogers' theory of student centredness. More than 35% of level 3 and level 4 respondents agreed that active participation was encouraged in class, which could be due to the fact that both level 3 and level 4 respondents were at a stage of wanting to learn, making sense of things they learn, and learning through feedback, as pointed out by Reece (cited in Bruce and Klopper 2017:248).

McGarry, Theobald, Lewis and Coyer (2015:967) concur that a paradigm shift from conventional nurse educator-centred approach to a student-centred approach that promotes active participation in class is necessary in the 21st century era. When students actively participate in class, they become drivers of their own learning, in line with Carl Rogers' theory of student-centredness.

4.2.4.4 Facilitation of learning in the classroom

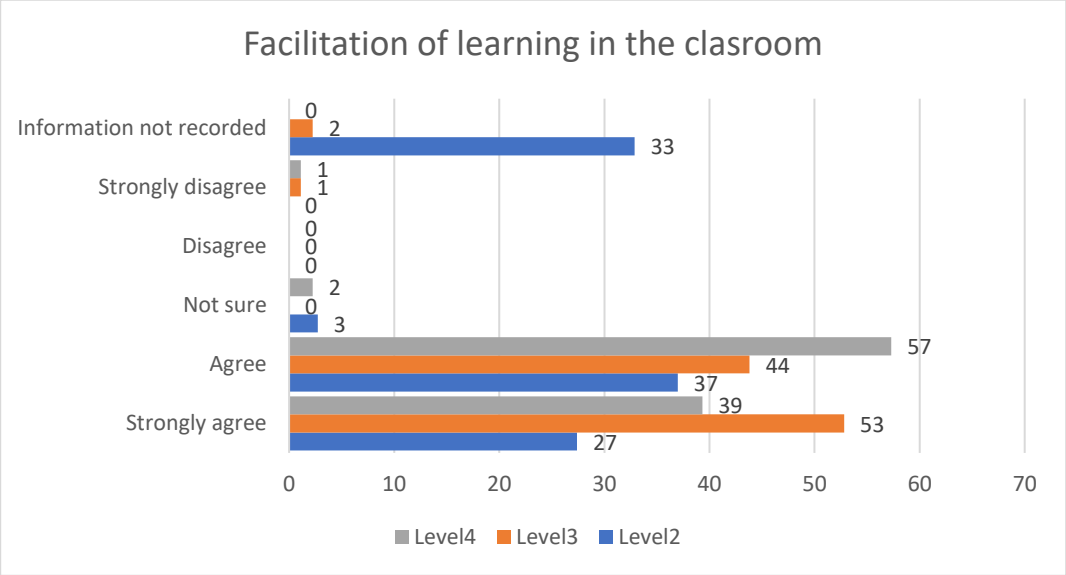

Figure 4.16: Facilitation of learning in the classroom

Respondents from level 2 (n=20, 27%), level 3 (n=47, 52%) and level 4 (n=35, 39%), strongly agreed that learning was facilitated in the classroom. Less than four percent of respondents across all levels were not sure or disagreed that learning was facilitated in the classroom. Thirty-three percent (n=24) of level 2 respondents did not indicate their views. The results indicate that respondents were happy about teaching and learning in the classroom. On the other hand, respondents may not have understood the term “facilitation” well, as in facilitated learning students manage and direct their own learning and do not wait for instructions (Bruce and Klopper 2017:140).

Desy, Reed and Wolanskyi (2017:245-246) state that 21st century students prefer to be well informed about what, how and why they are learning a specific topic. These students like collaborating in groups, so the nurse facilitator should recognise this element and facilitate learning rather than imposing his or her own ideas on them.

4.2.4.5 Use of other sources of information encouraged

Table 4.11: Encouragement to use other resources to search for information e.g. smartphone

Use of other resources	Level 2	Level 3	Level 4
Strongly agree	24 (33%)	13 (15%)	24 (27%)
Agree	22 (30%)	49 (55%)	34 (38%)
Not sure	0 (0%)	8 (9%)	11 (12%)
Disagree	3 (4%)	15 (17%)	13 (15%)
Strongly disagree	1 (1%)	2 (2%)	7 (8%)
Information not recorded	23 (32%)	2 (2%)	0 (0%)

The results reveal that the highest number of respondents who strongly agreed that they could use other resources to search for information were from level 2 (n=24, 33%), followed by level 4 (n=24, 27%) and then level 3 (n=13, 15%). More than 29% of respondents across all levels agreed that they could use smartphones or other technological devices in class to search for information, and less than 13% of respondents across all level were not sure. More respondents from level 3 (17%) and level 4 (15%) disagreed than respondents in level 2 (4%). About 32% of respondents from level 2 did not indicate their views, compared to two percent of respondents from level 3 none from level 4. Respondents indicated that they were given the opportunity to look up information using other sources; however, most online resources require internet connectivity, so respondents were not honest in their answer as Wi-Fi connectivity was previously cited as a challenge, Tshwane Free Wi-Fi bandwidth is too limited and the cost of data was a challenge.

Desy, et al (2017:245-246) state that 21st century students expect technology to be integrated in their teaching and learning as they incorporate technology into their daily lives and study lives. In a study on 38 21st century students' usage of iPads for a limited period, Bahner, Adkins, Patel, Douley, Nagel and Kman (2012:450) found that 86% reported daily iPad use and 70% preferred using iPads for researching journal articles. Giordano and Giordano (2011:80) found that the majority of health professions students preferred to search for information online using their smart devices, rather than using textbooks. In this study, level 2 respondents had been issued with tablets as they were regarded as bursary students. Therefore, they used e-books instead of hard copies and had easy access to technological devices.

4.2.4.6 Online discussion boards and class presentation

Table 4.12: Online participation in discussion boards and presentation in class is encouraged

Participation in online environment	Level 2	Level 3	Level 4
Strongly agree	10 (14%)	8 (9%)	8 (9%)
Agree	15 (20%)	34 (38%)	22 (25%)
Not sure	9 (12%)	13 (15%)	14 (16%)
Disagree	8 (11%)	19 (21%)	30 (33%)
Strongly disagree	8 (11%)	11 (12%)	14 (16%)
Information not recorded	23 (32%)	4 (5%)	1 (1%)

Of the respondents who participated, 10 (14%) from level 2, and eight (9%) each from level 3 and 4 strongly agreed that online participation in discussion boards and presentation in class was encouraged, while respondents who agreed consisted of 15 (20%) from level 2, 34 (38%) from level 3 and 22 (25%) from level 4. More than 10% of respondents across all levels disagreed and strongly disagreed that online participation was encouraged. About 32% of level 2 respondents did not record their responses, while five percent of level 3 and one percent of level 4 respondents also had no responses recorded.

The results do not concur with the actual practice at the institution under study, as the institution did not use online discussion boards and did not have hybrid courses at the time of the study.

Kent (2013:550) found that students preferred Facebook as an online discussion forum to other online discussion forums such as Blackboard, as most 21st century students are active on Facebook as their communication tool.

4.2.4.7 After class contact with lecturer

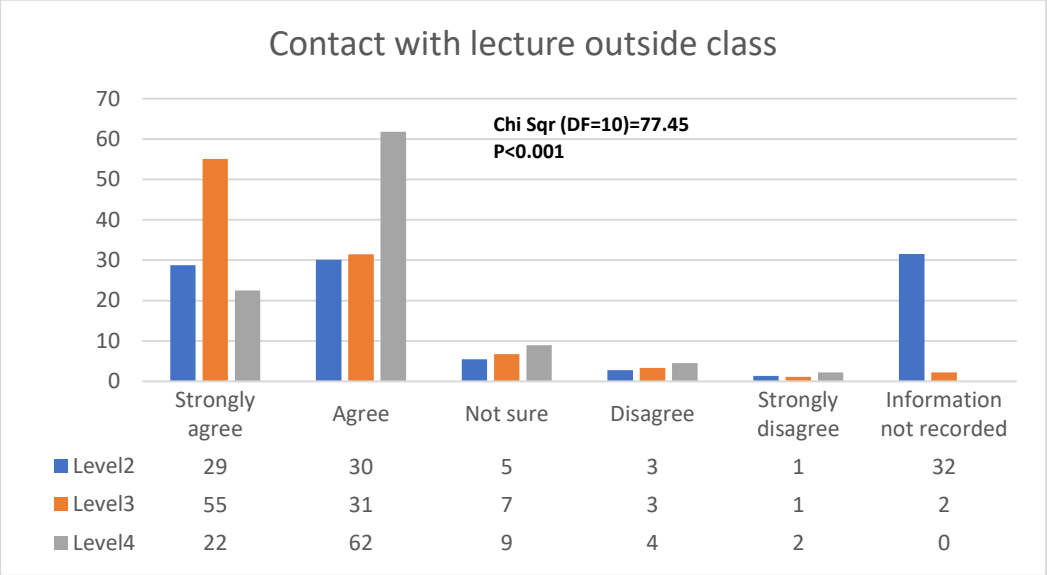

Figure 4.17: Contact with lecturer outside class

The number of respondents who agreed that they had contact with the lecturer after class was highly significant (X^2 (10, N = 251) = 77.45, p<0.001) across all levels (>20%), as compared to respondents who were not sure (<10%) and those who disagreed (<5%). The study found that respondents who strongly agreed that they had contact with nurse educator after class were mostly from level 3 (n=49, 55%), followed by respondents from level 2 (n=21, 29%) and then level 4 (n=20, 22%). More than 30% of respondents across all levels agreed with this statement. A low percentage of respondents (<5%) across all levels did not agree that they contacted lecturers after class. Thirty-two percent (n=23) of respondents from level 2 did not indicate their responses. Generally, the results revealed that after-class contact with the nurse educator was made available via social media means such as WhatsApp.

Rambe and Bere (2013:549) found that use of WhatsApp after hours with the nurse educator was a good way of extending academic consultation. Nurse educators would indicate to students the time slots at which they could be contacted, to assist students who needed extra help.

4.2.4.8 Different learning methods

Table 4.13: Different learning methods are respected at the NEI

Learning methods responses	Level 2	Level 3	Level 4
Strongly agree	16 (22%)	29 (33%)	12 (13%)
Agree	24 (33%)	46 (52%)	48 (54%)
Not sure	6 (8%)	7 (8%)	22 (25%)
Disagree	2 (3%)	4 (4%)	6 (7%)
Strongly disagree	1 (1%)	1 (1%)	1 (1%)
Information not recorded	24 (33%)	2 (2%)	0 (0%)

Respondents were requested to indicate whether the NEI where the study was conducted, respected different learning styles of students. A high percentage of respondents (>50%) from level 3 and level 4 agreed to this. Approximately two to seven percent of respondents across all levels disagreed and about 33% of respondents from level 2 did not record their views. This could imply that the nurse educators at the institution under study do acknowledge that every student is unique and learns differently; however, students have the ability to adapt to the common styles being used in order to benefit maximally (Bruce and Klopper 2017:170).

According to Pritchard (2016:41) and Truong (2016:1185), the nurse educator should be aware of and acknowledge students' different learning styles. Additionally, the nurse educator should offer opportunities for learning in different ways and use different teaching strategies for different topics, as students develop a sense of being in control when they are actively involved in their own learning. This is also in line with Carl Rogers' student-centred approach to learning. The use of role-play and debates are some examples of learning styles that can resonate with 'accommodators', as they learn mostly by doing things and actively participating in their learning (Bruce and Klopper 2017:172). These teaching strategies can be video recorded using devices such as smartphones and can then be viewed repeatedly.

Table 4.14: Attention to different learning styles

Attention is given to different learning styles of students	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Information not recorded
Level 2	6 (8%)	29 (34%)	12 (16%)	6 (8%)	1 (1%)	23 (32%)
Level 3	11 (12%)	49 (55%)	17 (19%)	8 (9%)	1 (1%)	3 (3%)
Level 4	9 (10%)	42 (47%)	25 (28%)	11 (12%)	2 (2%)	0 (0%)

More than 30% of respondents across all levels agreed that attention was given to students with different learning styles, while a few respondents (<13%) across all levels disagreed with the statement. Thirty-three percent of respondents in level 2 did not give any comments and more than 15% of respondents

from all levels were not sure whether the students with different learning styles were accommodated. Different strategies can be effectively utilised for different learning styles, and students learn best if teaching utilises their learning styles (Bruce and Klopper 2017:170).

4.2.4.9 Wi-Fi availability at the institution

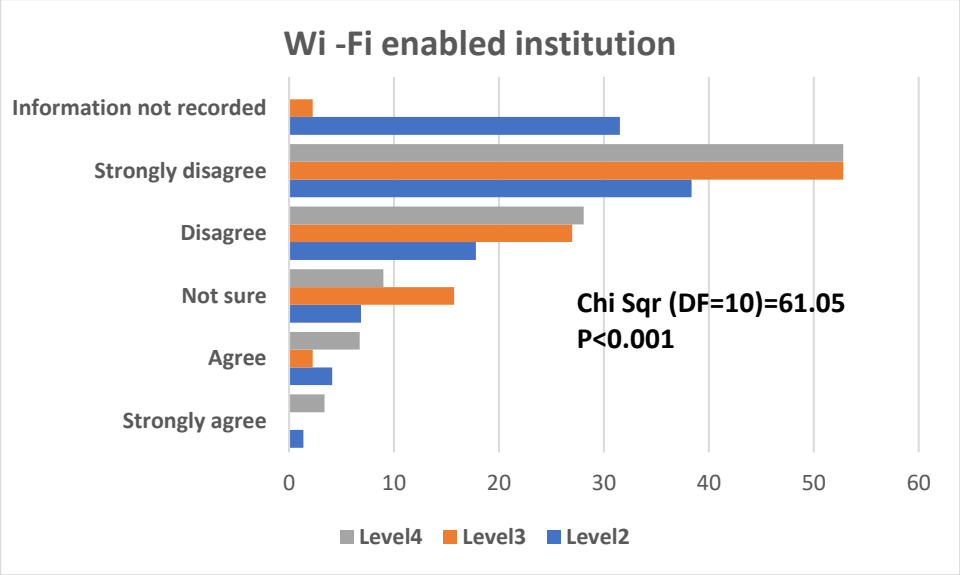

Figure 4.18: Wi-Fi availability at the institution

There was a highly significance difference (p<0.001) between the respondents (>30%) who strongly agreed that the institution was Wi-Fi enabled in all lecture halls as compared to respondents who disagreed (<30%). Of all respondents who participated (n=251), about 11 (4%) students agreed that there was a Wi-Fi network at the nursing education under study, while 27 (12%) were not sure. Sixty-two (25%) indicated that their institution was not Wi-Fi enabled. The majority of respondents from all levels (n=122, 49%) disagreed. Twenty-five (10%) respondents did not record their views. The results indicate that respondents could not differentiate between the Tshwane Free Wi-Fi and the institution's Wi-Fi, as Tshwane Free Wi-Fi can only be accessed in specific locations or spots.

According to Becker, et al (2017:22), digital equity is a necessary facility for the NEI and its students, as research will be improved when students utilise open educational resources from their own devices rather than overcrowding the library computers.

Table 4.15: Wi-Fi extended hours

Wi-Fi extended hours	Level 2	Level 3	Level 4
Strongly agree	4 (5%)	6 (7%)	12 (13%)
Agree	7 (10%)	16 (18%)	22 (25%)
Not sure	9 (11%)	17 (19%)	18 (20%)
Disagree	7 (10%)	19 (21%)	16 (18%)
Strongly disagree	23 (32%)	28 (32%)	20 (23%)
Information not recorded	23 (32%)	3 (3%)	1 (1%)

Respondents from all levels (>9%) agreed that Wi-Fi accessibility had extended hours at their institution, with only the high percentage of agreement (25%) in level 4. More than 20% of respondents in level 2 (n=23), level 3 (n=28) and level 4 (n=23) strongly disagreed that Wi-Fi accessibility had extended hours.

The results of this study indicate that respondents were not certain about how to differentiate between Wi-Fi from the NEI and the Tshwane Free Wi-Fi that they were sometimes able to access. Chawinga (2017:6) states that, in South Africa, the challenge of lack of technological infrastructure and bandwidth results in most students abusing internet connectivity (Wi-Fi) if it is available, rather than using it for study purposes. In addition, aligning Wi-Fi availability and lesson outcomes or curriculum may result in good utilisation for correct purposes.

4.2.4.10 Media centre at library

Table 4.16: Media centre at library

Media centre at the library	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Information not recorded
Level 2	17 (23%)	13 (18%)	9 (12%)	9 (12%)	2 (3%)	23 (32%)
Level 3	19 (21%)	36 (41%)	23 (26%)	3 (3%)	3 (3%)	5 (6%)
Level 4	29 (33%)	42 (47%)	8 (9%)	6 (7%)	4 (4%)	0 (0%)

Respondents were requested to indicate whether the library had a media centre which was accessible to students. A large number of respondents from level 3 (n=36, 41%) and level 4 (n=42, 47%) strongly agreed with this statement, while more than 20% of respondents across all levels (23% from level 2, 21% from level 3 and 33% from level 4) agreed. Less than 12% of respondents across all levels disagreed with the statement. Between nine percent and 26% of respondents across all levels were not sure. Gan, Menkhoff and Smith (2015:663) state that media centres are ideal to encourage collaboration among students. However, institutions will have to ensure that there are sufficient resources to purchase equipment and to train nurse educators in the use of these facilities so as to facilitate students' usage of these resources.

4.2.4.11 Technical support availability

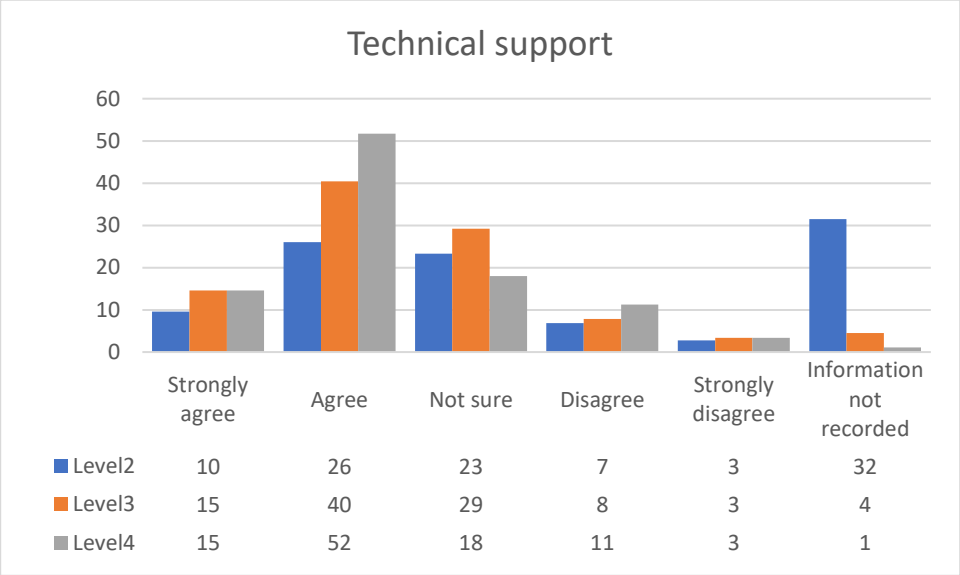

Figure 4.19: Technical support availability for assistance and tutoring in using computers

The results of this study show that 26%, 40% and 52% of respondents from level 2, level 3 and level 4 respectively agreed that they could be assisted when they had technical challenges at the NEI under study. However, <11% of respondents did not support this statement, a significant number of respondents (>17%) were not sure and 32% of respondents from level 2 did not record their views. These results concur with literature from similar studies on availability of technical support for students and nurse educators, especially to students who encounter challenges in engaging with content or with the devices used (Porter, Graham, Spring and Welch 2014:187). The results imply that most respondents could be assisted with challenges encountered with technological means during teaching and learning in the classroom, to ensure that the lesson did not get interrupted for prolonged periods. This technical support was, however, not available for students' personal devices such as mobile phones, iPads or laptops, due to financial constraints.

4.2.4.12 Class presentations by students

Table 4.17: Students often give presentations in class

Students give presentations in class	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Information not recorded
Level 2	25 (34%)	25 (34%)	0 (0%)	0 (0%)	0 (0%)	23 (32%)
Level 3	43 (48%)	40 (46%)	2 (2%)	1 (1%)	1 (1%)	2 (2%)
Level 4	54 (61%)	34 (38%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)

Of the 251 respondents, 34%, 48% and 61% from level 2, level 3 and level 4 respectively strongly agreed that they gave presentations in class, while between 34% and 46% agreed. A low percentage (<2%) of respondents did not agree that they gave presentations in class. The results could imply that the nurse educators did at times implement the facilitator role in teaching students, as they allowed respondents to give presentations to play an active role in their own learning. Active participation and the facilitator style of teaching encourage students to think critically, thus developing and sharpening their reasoning skills, which are key skills in the clinical environment (Chilemba and Bruce 2015:e55).

4.2.4.13 Time awarded for different teaching methods

Table 4.18: Percentage of time awarded for teaching method

Level 2					
Percentage time for teaching method	**Lecture**	**Group discussion**	**Presentation**	**Role-play**	**Simulation**
20	1 (2%)	10 (14%)	6 (8%)	14 (20%)	9 (12%)
40	4 (8%)	14 (19%)	8 (11%)	11 (15%)	6 (8%)
60	7 (15%)	15 (21%)	14 (20%)	15 (21%)	15 (21%)
80	21 (44%)	7 (10%)	11 (15%)	4 (5%)	11 (15%)
100	15 (31%)	2 (3%)	9 (12%)	4 (5%)	7 (10%)
Information not recorded	0 (0%)	25 (34%)	25 (34%)	25 (34%)	25 (34%)
Level 3					
Percentage time for teaching method	**Lecture**	**Group discussion**	**Presentation**	**Role-play**	**Simulation**
20	2 (3%)	10 (11%)	13 (15%)	44 (49%)	23 (26%)
40	3 (4%)	31 (35%)	15 (17%)	21 (24%)	13 (15%)
60	14 (17%)	21 (24%)	27 (30%)	9 (10%)	13 (15%)
80	37 (45%)	16 (18%)	24 (27%)	9 (10%)	18 (20%)
100	20 (32%)	5 (6%)	4 (4%)	0 (0%)	15 (17%)
Information not recorded	0 (0%)	6 (7%)	6 (7%)	6 (7%)	7 (8%)
Level 4					
Percentage time for teaching method	**Lecture**	**Group discussion**	**Presentation**	**Role-play**	**Simulation**
20	8 (9%)	13 (15%)	9 (10%)	31 (35%)	24 (27%)
40	10 (11%)	20 (22%)	14 (16%)	11 (12%)	12 (13%)
60	23 (26%)	18 (20%)	25 (28%)	18 (20%)	18 (20%)
80	29 (33%)	22 (25%)	23 (26%)	16 (18%)	18 (20%)
100	17 (20%)	14 (16%)	16 (18%)	10 (11%)	14 (16%)
Information not recorded	0 (0%)	2 (2%)	2 (2%)	3 (3%)	3 (3%)

Respondents were requested to indicate the percentage of time awarded to each teaching method in class. The manner in which the respondents gave the percentage time allocation for each teaching method followed the same pattern. The results of the study show that, even though role-play was rated the most utilised teaching method (n=44, 49%), the time allocated for this method was too low (20 over 100) compared to other teaching methods. The lecture method utilised the most time allocated (80 and 100 over 100) compared to other teaching methods. The presentation method was unpopular among level 2 respondents as compared to the other levels. More than 30% of respondents in level 2 did not record information on the time allocation of group discussion, presentation, role-play and simulation. The lecture method of teaching is often associated with surface learning, as the lecturer as “an expert” imparts information to students, who are often passive receivers. This teaching method has to be coupled with newer teaching methods that stimulate reasoning skills and put the student at the forefront of learning, instead of hindering students’ development (Chilemba and Bruce 2015:e59).

4.2.4.14 Conducive learning environment

Table 4.19: Conducive learning environment

		Yes	No
Good ventilation	Level 2	54 (74%)	19 (26%)
	Level 3	35 (39%)	54 (61%)
	Level 4	22 (25%)	67 (75%)
Clean environment	Level 2	59 (81%)	14 (19%)
	Level 3	67 (75%)	25 (22%)
	Level 4	57 (64)	32 (36%)
Over crowding	Level 2	61 (84%)	12 (16%)
	Level 3	71 (80%)	18 (20%)
	Level 4	49 (55%)	40 (45%)
Technology use	Level 2	69 (95%)	4 (5%)
	Level 3	84 (94%)	5 (6%)
	Level 4	84 (94%)	5 (6%)
WIFI enabled	Level 2	67 (92%)	6 (8%)
	Level 3	78 (88%)	11 (12%)
	Level 4	77 (87%)	12 (13%)
Distraction	Level 2	48 (66%)	25 (34%)
	Level 3	52 (58%)	37 (42%)
	Level 4	18 (20%)	71 (80%)
Equipment	Level 2	49 (67%)	24 (33%)
	Level 3	54 (61%)	35 (39%)
	Level 4	36 (40%)	53 (60%)
Active participation	Level 2	55 (75%)	18 (25%)
	Level 3	67 (72%)	22 (25%)
	Level 4	62 (70%)	27 (30%)

The majority of respondents (between 55% and 84%) across all levels indicated that the classroom environment must be clean and not be overcrowded. Surprisingly, only respondents from level 2 (n=54, 74%) indicated that the environment should have good ventilation, while respondents from level 3 (n=54, 61%) and level 4 (n=67, 75%) were not concerned about a well-ventilated environment. Most of the respondents across all levels (>85%) stated that the classroom environment should be Wi-Fi enabled and allow use of smart devices in class; however, only a few level 4 (n=18, 20%) respondents did not perceive using of smart device in class as being a distraction.

More than 60% of respondents from level 2 and level 3, and 40% from level 4, stated that equipment used in the classroom environment should be fully functional and serviced regularly. Learning can be

hindered by inadequate and malfunctioning equipment, so the results indicate that proper maintenance of equipment in necessary to enhance learning. Above 70% of respondents across all levels viewed active participation as promoting learning in the classroom. Most respondents (between 55% and 84%) were concerned about the physical learning environment in which teaching and learning occurred, as the environment can influence learning positively or negatively. A significantly high number of respondents (>85%) pointed out that a Wi-Fi enabled classroom environment that allowed use of smart devices would be an ideal learning environment.

Sulaiman (2015:432) states that, in order to create a conducive classroom environment, a student-centred teaching approach should be considered. Furthermore, Mathevula and Khoza (2014:20) state that a positive lecturer–student relationship and a safe nurturing environment all promote a conducive learning environment for the student. Bruce, et al (2011:106) state that the nurse educator may not always have control over the physical learning environment, but should always attempt to ensure that there is adequate lighting and room temperature, few distractions, and appropriate seating arrangements for students so as to facilitate learning.

4.3 CONCLUSION

This chapter shed light on technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane. The results of the study were analysed, presented and interpreted in relation to literature reviewed.

The results indicate that various technological means influence the teaching and learning of undergraduate students in the 21st century. The use of technological devices in the classroom, teaching strategies that promote student-centredness and the availability of Wi-Fi at the NEI promote learning and facilitate the teaching of undergraduate students who use smart devices daily for social interaction and learning purposes.

Chapter 5 describes the study's conclusions, implications, limitations and recommendations for further research.

CHAPTER 5
CONCLUSIONS, IMPLICATIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The previous chapter provided the presentation and interpretation of results. This chapter focuses on the summary of study, as well as the implications, limitations and recommendations of the study based on the research findings in the previous chapter. The aim of this study was to determine the technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane and to assess the teaching strategies that could be used to influence the students' teaching and learning in the 21st century. The study was undertaken from the premise that traditional methods of teaching undergraduate students, who are mostly part of Generation Y, are obsolete in this era of technological advancement, and have to be replaced by more modern means of teaching, to enhance learning.

A quantitative research approach was utilised to meet the study aim and objective. A structured questionnaire was used to obtain data from level 2 to level 4 undergraduate students who were enrolled for the Diploma in Nursing (General, Psychiatry and Community) and Midwifery (R.425) at the NEI under study. The questionnaire was designed in order to collect data from the respondents. Recommendations from this study also considered the views of the respondents on technological means utilised in their teaching and learning at the selected NEI.

How the Humanistic theory of Carl Rogers student centeredness was applied in the study

Carl Rogers' student-centred approach guided the researcher throughout the study. The student-centred approach involves the view that the student should be at the forefront of learning, like the Generation Y students whose smartphones, iPods and tablets, among others, play a vital role in their daily lives for social networking and communication and who are happy to use these devices also in class and in their own learning. The nurse educators' focus should be centred on what can enhance student learning and promote critical thinking. Implementing teaching strategies such as literature search may encourage student-centredness and active participation, and promote students' critical thinking, allowing students to take the lead in their own learning, while being supported by the nurse educator who facilitates teaching.

5.2 SUMMARY OF RESEARCH RESULTS

Findings are discussed according to the research questions and format of the questionnaire.

5.2.1 Demographic data

Demographic data discussed in this section include gender, age, year of study and instructional language.

The results from this study indicate that a large number of the respondents were female (n=186, 74%), while 14% (n=34) were male and 12% (n=31) of respondents did not indicate their gender. In this study, gender had no influence on technological means influencing teaching and learning; however, the sample composition shows that the nursing profession is traditionally known as a domain for women.

Most respondents who were above the age of 30 were in level 4 (n=28, 32%). However, the majority of respondents from level 3 (n=51, 57%), level 2 (n=23, 31%) and level 4 (n=42,4 7%) were within the age range of 21-25 years, as shown in Table 4.1. The study results support literature on 21st century undergraduate students which indicates their age range to be between 19 and 33 years. These students are of the millennial generation that is technologically orientated, and would be happy to incorporate the use of technological tools in their teaching and learning (Wang, Niiya, Mark, Reich and Warschauer 2015:1).

The year of study had some significance in the findings as level 2 respondents were not issued with hard copy textbooks but had e-books downloaded on their tablets.

English was found to be the medium of instruction at the NEI under study, with most respondents (n=216, 86%) attesting to this. Interestingly, some level 2 respondents (n=35, 34%) indicated that English was not the medium of instruction. This could be due to some lecturers occasionally clarifying certain important facts in the students' home language to enhance understanding, after which they would revert back to using English (Brock-Utne 2010 and Benson 2009 as cited in Nqoma, Abongdia and Foncha 2017:8819).

5.2.2 Technological means in teaching and learning of undergraduate students

Technological means utilised by respondents in learning and the nurse educators in teaching are discussed under the following sub-topics that were identified:

5.2.2.1 Use of technological means in learning

The study results show that the use of technological devices varied significantly across the different levels of respondents, with a chi-squared value of $X^2 = 63.96$. The majority of respondents used a technological device in their daily learning, as almost all respondents in the study owned technological devices such as smartphones and brought their devices along to class. The results of the study, based

on the analysis and interpretation of data, are that more than 60% of respondents across all levels indicated that they used a technological device in their daily learning to conduct research related to content being taught in class and to find alternative ways of problem-solving in learning as they shared information with colleagues and friends.

These results concur with literature on 21st century undergraduate students' heterogeneity in using technological means for social communication, which revealed that the use of social media among these students may vary depending on individual factors such as socioeconomic status, emotions and age, even though they may all be taught and learning in the 21st century.

On the contrary, a high percentage of level 4 respondents (84%), followed by level 3 respondents (70%) and then level 2 respondents (42%), indicated that they did not benefit from using technological devices in learning due to Wi-Fi constraints at the NEI under study. Despite the fact that access to information through technological devices that respondents owned was easy and convenient, respondents could not effectively benefit from their use due to Wi-Fi constraints.

The study results also indicate that the high cost of data in South Africa is a limiting factor in the use of technological devices in classroom learning. Due to the limited Tshwane Free Wi-Fi internet access and the unavailability of NEI-provided free Wi-Fi access, respondents were faced with having to use their own data to access research articles when not using the library computers. This poses a challenge as not every student could afford the costs of data.

The social media policy of the NEI prohibited the use of technological device during lessons by students unless permission to do so was granted by the nurse educator. This implies that students were not encouraged to fully utilise technological devices to enhance classroom learning due to rigid management practices. These results are supported by Mwanza-Simwami (2011:75), who alludes to the fact that integration of technological means in classroom learning can be a success if a structure relating to its use, rather than complete prohibition, is put in place, so that student learning is not negatively impaired.

5.2.2.2 Teaching strategies used in class

The results from this study indicate that PowerPoint lesson presentation was the most commonly used method to deliver lessons in class, in comparison to literature search, video presentation and podcasts. This implies that respondents were still used to the traditional way of teaching, the lecture method, as a PowerPoint lesson is a projection of slides of a lecture, a one-way teaching method where the nurse educator is the one with more information and knowledge on the subject and students sit on the receiving end. However, most respondents enjoyed the benefits of using their technological devices to take

pictures of slides so that they could refer to them later during self-study. More than 80% of respondents from all levels did not prefer the literature search method, which is a method that encourages active participation and critical thinking, although almost all respondents confirmed ownership and use of a technological device in their daily learning as a social norm. Even though level 2 respondents used tablets instead of hard copies, they still did not prefer the literature review method for teaching, which would require use of the tablet and internet access.

Group discussion was the second most favoured teaching method, and is viewed as another method that promotes collaboration and active student participation (Bruce and Klopper 2017:274). The results indicate that respondents preferred to choose group members themselves rather than being allocated groups by the nurse educator. Some positive response was shown towards this teaching method, with the majority (n=53, 63%) of level 4 respondents citing it as the second most preferred method of teaching. Bruce and Klopper (2017:274) concur that group discussion is a valuable teaching strategy, especially for more senior students, as the emphasis is on active student participation and exchange of ideas.

Discussion boards, which are similar to group discussions but online, were most unpopular among respondents across all levels. This could be largely due to lack of Wi-Fi access in the lecture halls and inadequate knowledge and training about the method on the part of the nurse educators. Discussion boards also require the institution under study to use a learning management system so that a platform can be created for such online discussions and the nurse educator can facilitate and monitor participation of students. Discussion boards are believed to promote social interaction between both students themselves and students and the nurse educator, as alluded to by Chou (2012:25).

5.2.2.3 Benefits of using technological device in learning

The study results show that more than half of respondents across all levels agreed that technological devices helped them with research for additional information when being allowed to use these in class. Some respondents stated the device being user-friendly and the device being portable as benefits for use in learning. More than 55% of respondents from all levels indicated that technological device use was not beneficial in enhancing understanding of the lesson content.

5.2.2.4 Barriers to using technological device in class

A small percentage of respondents (n=25, 34%) from level 2 identified barriers such as poor battery life of their devices, with no charging ports in the lecture halls, or perhaps only one at the main desk, mainly for use by the nurse educator. Lack of Wi-Fi and internet access was cited as a barrier by fewer level 2

respondents (n=27, 37%) compared to respondents in level 3 and 4 (n>45, >50%). Surprisingly, respondents from level 3 and 4 were not in possession of tablets, so it could be assumed that they would be the least affected by the lack of internet access as they also had hard copies to refer to, compared to the level 2 respondents who solely used tablets.

Lack of technical support was identified as a challenge, as there were only a few members in the institution's technical team and the support they offered was mainly for nurse educators and other staff members, not students. Any personal technical challenge encountered by students at the institution would be taken up by the individual students themselves, except with regard to classroom equipment malfunction.

Time allocated for device use in class was one of the barriers indicated by the study results. Respondents had a challenge with regard to freely using their devices in class for learning purposes. Despite the many advantages of using technological devices in classroom learning, students were allowed to do so when instructed by the nurse educator to look up additional information, as the use of such devices was deemed to be a distraction of the lesson. According to Desy, et al (2017:245-246), 21st century students expect technology to be integrated within their teaching and learning as they use it in both their daily and study lives. In addition, Oliveira, et al (2018:954) state that nurse educators are competing for students' attention with Facebook, WhatsApp, Twitter and other social media platforms, so they need to entice students by utilising the above for teaching and learning purposes.

5.2.2.5 Contact with the nurse educator after class

The study shows that, generally, contact with the nurse educator after class was made available through technological means on social media, mostly through WhatsApp. WhatsApp is viewed as one of the ways to extend academic consultation, and it was indeed utilised at the institution under study by most nurse educators to communicate important information to students and to assist those students that may need extra help academically.

5.2.2.6 Wi-Fi availability at the institution

Results of the study show that respondents confused Tshwane Free Wi-Fi and Wi-Fi access made available at the selected NEI. Respondents had access to Tshwane Free Wi-Fi in certain spots for a limited period due to the limited bandwidth and limited access; however, the selected NEI had not yet rolled out free Wi-Fi access to students due to budget constraints and the infrastructure that still needed to be overhauled, particularly as all public NEIs are preparing to move to higher learning. For the NEIs

to be ready to be part of higher learning institutions, the infrastructure has to comply with 21st century teaching and learning requirements, where students will be able to have access to broadband Wi-Fi.

5.3 LIMITATIONS OF THE STUDY

The study was conducted only at the selected NEI and the results were limited to the specific NEI in Tshwane. Therefore, results cannot be generalised to other NEIs in the rest of the province, other provinces and the country.

The study focused on the teaching and learning of undergraduate students at the NEI under study. However, teaching and learning are interdependent and the nurse educators' voices results would have yielded more information about teaching from their point of view.

The open-ended question on "conducive environment" on the questionnaire required respondents' views on a conducive environment for teaching and learning; however, the question was not linked to technological means, so the results thereof could not be generalised to other NEIs.

5.4 RECOMMENDATIONS OF THE STUDY

5.4.1 Effective teaching and learning

Teaching and learning are not only about what is being taught (the subject matter), but also how the teaching is conducted. Teaching and learning are interrelated and form a didactic triangle consisting of the nurse educator, the student and the content, which is informed by the curriculum. The mode of delivering the curriculum content forms the fourth component of the triangle, namely, the method of content delivery, teaching and learning activities, instructional techniques and assessments (Bruce, et al 2011:207). Facilitative teaching strategies that encourage deeper learning and evoke critical thinking and reasoning skills among students are recommended. The results from utilisation of strategies such as discussion boards, literature searches and group discussions are likely to produce qualified professional nurses who will be equipped with skills to conduct research to investigate and solve problems in the ever-changing, complex workplace, to improve standards of care.

5.4.2 Department of Health – Gauteng Province

In line with the transformation of nursing education to move all public NEIs to higher education in pursuit of quality of education and training, this move has to be in line with 21st century teaching and learning, with the focus placed on the student. Teaching approaches such as blended learning require adaptability on the part of the nurse educator, as well as support and training with regard to technology and the use of paperless environments, which may require budgetary provision from the Department of Health.

5.4.3 Nursing education institution's teaching environment

- Since millennial students are technologically inclined, a teaching environment that uses technology in classroom teaching similar to their expectations would be ideal in order to stimulate them. This is supported by Henry and Gibson-Howell (2011:230) and Hart (2017:254), who view millennials as a generation of students who reflect their culture, love technology, enter the nursing profession with some background from their previous schools and tertiary institutions, and have been taught using various student-centred approaches to develop their critical reasoning skills.

- It is recommended that undergraduate students, who are mostly part of Generation Y and grew up using technology in their daily lives, be given the opportunity to use their smart devices in class, albeit only for learning purposes as students can go on social media sites without the nurse educator being aware of it.

- As the NEIs prepare to move to higher education, classrooms with video conferencing facilities and student microphones would be ideal, using locally manufactured technology that uses renewable energy where possible. However, this will depend on budget availability and will need to fit in with the sociocultural environment of the local community that the institution is serving. Classroom seating arrangements and furniture will have to be modified to accommodate small group discussions.

- The library should also be transformed into a learning centre, given the necessary funds from the government. Provision should be made for different study booths, each with its own computer with DVD player, an electrical outlet for the use of electronic equipment and charge ports for students to charge their mobile devices. These are referred to as "wet booths", and if there are no electrical sources in the study booth, they are referred to as "dry booths".

- It is evident that technology is here to stay, and it is challenging the current status quo and current teaching and learning practices. Teaching strategies have to adapt to current trends, especially as NEIs are in the process of moving to higher education. Students have to be at the forefront of teaching and learning, be self-directed, and learn from self-inquiry. Nurse educators should incorporate the use of blended learning environments such as hybrid learning, where certain parts of the learning programmes are presented online and other parts presented in the conventional way, using methods such as lectures and group discussions, as suggested also by Hugo and Fakude (2015:106).

- Nurse educators should be given training on informatics and the use of social media platforms upon appointment and on an ongoing basis, so as to be able to revamp their current skills on computer literacy, to be able to cope with millennial students who are technologically inclined, and to prepare nurse educators to work in a paperless environment, which is fast taking over most institutions in the country.

- Teaching strategies such as podcasts and online discussion boards should be gradually introduced at the NEI. As teaching becomes student-centred, students who miss a lecture, perhaps due to absenteeism or ill health, and want to catch up with missed content, would be able to download the recorded podcast lecture and listen to or even view it while on their way home or during leisure time. Online discussion boards will strengthen student–lecturer communication, and encourage students' active participation in their own learning while improving peer learning. The nurse educator's role will be that of a facilitator and to offer guidance where needed.

- The NEI should have a website that students can access and register on to access the institution's learning management system. From here, online forums and discussion boards could be monitored, and a platform could be provided for student communication, institutions regulatory policies and all uploaded documents for access by everyone who has the right to such information.

- Budget needs to be made available for all public NEIs to make Wi-Fi access available to all enrolled students to facilitate learning.

5.5 RECOMMENDATIONS FOR FURTHER RESEARCH

A study should be conducted that focuses on the following concerns:

- Institutional philosophy and teaching policy.
- Available resources and feasibility.
- Information technology and online security challenges.

5.6 CONCLUSION

The objective of the study was to determine the technological means in 21st century undergraduate students' teaching and learning at an NEI in Tshwane. The study followed a quantitative approach using a non-experimental descriptive design. A structured questionnaire, with closed- and open-ended

questions, was used to collect data from level 2 to level 4 undergraduate students at an NEI in Tshwane. Responses from the respondents were captured and analysed with assistance from the statistician.

Results of the study indicate that undergraduate students at the NEI where the study was conducted were not utilising technological means in their learning optimally, although the majority of the students were from Generation Y and therefore conversant with the latest technological developments. Despite the fact that all students were in possession of smart devices, ranging from smartphones to tablets, students used their technological devices mostly for communication purposes rather than for research and study purposes.

Likewise, nurse educators were not utilising teaching strategies in line with 21st century teaching and learning, as such strategies require infrastructure adjustments and upskilling of the nurse educators themselves to be conversant with latest teaching strategies that utilise technology. Availability of Wi-Fi was identified a limiting factor, as students had to use their own data for internet access at the NEI due to limited Tshwane Free Wi-Fi availability. Student-centred learning was not practised, as the traditional lecture method was still the most utilised teaching strategy, using PowerPoint slides to project lecture contents. Students were not yet being exposed to latest technological means of teaching and learning, as budget and some adjustments to infrastructure have to be looked at first. Student-centredness has yet to be implemented as the institution prepares to move to higher education in 2019, as the new curriculum puts the student at the forefront of teaching and learning.

The results of the study will be forwarded to the NEI's management and nurse educators to make them aware of the present situation, and to encourage nurse educators to keep up to date with the latest technological means of teaching students in line with 21st century expectations. Technological means in 21st century undergraduate students' teaching and learning at this NEI in Tshwane were found to be less utilised. Teaching strategies that were utilised by nurse educators were also determined and were not fully in line with 21st century teaching and learning. More work still needs to be done at the NEI.

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ANNEXURE A: PLAGIARISM DECLARATION

Student number: 95288270

I Phonia Nambewe Bopape declare that the thesis "**Technological means in teaching and learning of undergraduate students in the 21st century at a nursing education institution in Tshwane"** is my original work and that it has not been submitted either in whole or in part, for the purpose of acquiring a degree at this or any other university. All sources that have been used and quoted have been properly acknowledged and referenced by means of a complete list of references in accordance with departmental requirements.

PHONIA NAMBEWE BOPAPE **DATE:**

ANNEXURE B: QUESTIONNAIRE

FOR OFFICE USE ONLY: LEVEL: _____
QUESTIONNAIRE NO: _____ **(**for office use)

ANNEXURE: B (1)

QUESTIONNAIRE FOR STUDENTS

This questionnaire is divided into three (3) sections. It will take you a maximum of 20 minutes to complete.
Please answer all the questions by ticking in the box and filling in the spaces provided.
Do not write your name on the questionnaire.
Please do not write on the space marked "questionnaire no:"
The return of the questionnaire will be considered as an informed consent.

SECTION A: DEMOGRAPHIC DATA

1. Gender:

Male		Female	

2. Age (years) _____

3. Year of study? _____

2nd year ☐

3rd year ☐

4th year ☐

4. Instructional language

English ☐

Afrikaans ☐

Other (please specify) _____

SECTION B: TECHNOLOGICAL MEANS

Instructions: Please tick all that is relevant.

6. How often do you use technological tools (blogging, smartphone, Face book video lectures, skype, webinars, other) for your studies?

- Daily ☐
- Once a week ☐
- Twice a week ☐
- Never ☐
- Other (please specify) _____

7. What methods are used to deliver lessons in the classroom?

- Power point presentation lecture ☐
- Video ☐
- Literature search ☐
- Group discussion ☐
- Discussion board ☐
- Other (please specify) _____ ☐

8. How do you communicate with the lecturer after classes or after hours?

- Email ☐
- By appointment –face to face ☐
- Whats app /text message ☐
- Face book page ☐
- Other (please specify) _____

9. Do you own a technological device e.g. smart phone, iPad, and laptop?

Yes	
No	

10. Do you often post videos and your comments on topics that interest you on your Facebook page so people can comment on it?

Yes	
No	

10.1. Does the institution offer Microsoft Office lessons to students?

Yes	
No	

11. If yes, how often? _____

12. If no, where did you learn how to use a computer?

_____

_____

13. Who paid for your computer lessons?

_____

_____

14. Does the institution have access to technology that is Wi-Fi enabled?

Yes	
No	

14.1. If no, how do you access internet linked resources while at the institution? Please explain below.

_____

_____

_____

15. Which teaching method do you prefer among the ones listed below? Tick in the boxes provided (You can tick more than one answer).

Power point presentations ☐

Lecture method ☐

Video ☐

Podcast ☐

Group work/Discussion ☐

15.1. Why do you prefer these teaching methods?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

15.2. Give suggestions about possible improvements of the chosen methods in question number (15) to improve learning.

_____
_____
_____

16. What are the opportunities/benefits you experience in using your smart phones /own devices e.g. (iPad, laptop, and tablet) in learning?

Opportunities/benefits:

17. What are the barriers of using your smart phones / own devices (e.g. iPad, laptop, tablet) in class?

Barriers:

18. What could be the possible solution to resolve the above barriers?

SECTION C: TEACHING AND LEARNING IN THE CLASSROOM

(This section tests technological means in the classroom environment that enhance teaching and learning of students at the institution)

Likert scale 5- point modified scale: Please select the most appropriate response:

(1= strongly agree; 2= agree; 3= Not sure; 4= disagree; 5 = strongly disagree)

Please select the most appropriate option by circling the chosen option, please answer all questions asked.

19. The classroom environment promotes interactive, collaborative learning.

Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

20. Expectations about learning are discussed and agreed upon before the lesson commences.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

21. The nurse educator encourages active participation in class.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

22. The nurse educator facilitates learning in the classroom.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

23. Students are encouraged to use other resources like smart phone, tablet, and laptop in class to search for information.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

24. Participation in online discussion boards and presentations in class is encouraged.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

25. Out- of class contact with the nurse educator is made available to students.

Strongly agree	Agree	Not sure	Disagree	Strongly agree
1	2	3	4	5

26. Different learning methods are respected at the institution.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

27. Attention is given to different learning styles of students within the institution's environment.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

28. The nursing education institution is Wi-Fi enabled in all lecture halls.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

29. Wi-Fi has extended hours that provide students access to do research.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree

1	2	3	4	5

30. The library has a media centre (audio/visual) which is accessible to students.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

31. Technical support is available for assistance and tutoring in using computers at the library.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

32. Students often give presentations in class.

Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
1	2	3	4	5

33. Please indicate the percentage (%) of time awarded for **each** method of teaching out of 100%, indicate by placing a cross in the relevant box. **E.g. lecture = 10% (X in 10-20%).**

	10-20%	21-40%	41-60%	61-80%	81-100%
Lecture					
Group discussion					
Presentations					
Role play					
Simulation					

34. Describe, in your own words, a conducive learning environment (an environment that promotes learning).

THANK YOU FOR YOUR PARTICIPATION.

ANNEXURE C: INFORMATION LEAFLET AND INFORMED CONSENT

PARTICIPANT'S INFORMATION LEAFLET & INFORMED CONSENT FOR NON –CLINICAL RESEARCH

Researcher's Name: Phonia Nambewe Bopape **Student Number: 95288270**
Department of Nursing Science **University of Pretoria**

TITLE OF STUDY: TECHNOLOGICAL MEANS IN TEACHING AND LEARNING OF UNDERGRADUATE STUDENTS IN THE 21ST CENTURY AT A NURSING EDUCATION INSTITUTION IN TSHWANE.

Dear Participant

I am a Master's student in the Department of Nursing Science, University of Pretoria. You are invited to volunteer to participate in our research project regarding the "Technological means in teaching and learning of undergraduate students in the 21st century at a Nursing Education Institution in Tshwane".

This letter contains information to help you with your decision to take part in this study. Please read carefully through the letter in order to make an informed decision. If the information is unclear or if you have any other questions, do not hesitate to ask us. You should not agree to take part in this study unless you fully understand the content of this letter.

NATURE AND PURPOSE OF THIS STUDY

The study aims to determine technological means in enhancing teaching and learning of undergraduate students in the 21st century at a Nursing Education Institution in Tshwane. You, as a participant, are a very important source of information in determining the technological means in teaching and learning of undergraduate students in the 21st century.

EXPLANATION OF PROCEDURE TO BE FOLLOWED

We ask you to complete a research questionnaire. By completing and returning the questionnaire, you give consent that the information received can be used for the research. Confidentiality and anonymity will be ensured by omitting your identity in any publication, information obtained will not be revealed to anyone outside the research team. The researcher will be available to answer questions you might have regarding the questionnaire. The questionnaire will take approximately 20 minutes to complete. Please complete the questionnaire and upon completion, please place it in the designated research box provided to be collected by the researcher and the research assistant.

RISK AND DISCOMFORT INVOLVED

Except for the time it takes to complete the questionnaire of approximately 20 minutes, there is no known discomfort or inconvenience related to this study. We appreciate your time.

POSSIBLE BENEFITS OF THIS STUDY

The study will identify technological means in teaching and learning of undergraduate students in the 21st century at a Nursing Education Institution in Tshwane. The study seeks to offer recommendations to senior stake- holders to incorporate technology mediated education and blended- learning strategies that could be used in teaching and learning undergraduate students to improve efficiency of training in the face of social, economic, health and educational challenges.
The results will be submitted to the Principal of the Nursing Education Institution in order to make recommendations and suggestions of systems to be put in place to improve teaching and learning of undergraduate students in the 21st century.

WHAT ARE YOUR RIGHTS AS A PARTICIPANT IN THIS STUDY?

Your participation in this study is entirely voluntary and you can refuse to participate or stop at any time without any reason.

HAS THE STUDY RECEIVED ETHICAL APPROVAL?

The study proposal was submitted to the Research Ethics Committee of the University of Pretoria, Faculty of Health Sciences.
The faculty has granted written approval.

INFORMATION AND CONTACT PERSON

If you have any questions during this study, please do not hesitate to approach the researcher.

Researcher:	Mrs P.N. Bopape	081 310 9202
Supervisor:	Dr S.S. Moloko-Phiri	012 354 1791
Co- supervisor:	Dr N. Mshunqane	012 354 1791

COMPENSATION

All information obtained during the course of this study is strictly confidential. Data that may be reported in scientific journals will not include any information that can identify you as a participant in this study.

THANK YOU FOR TAKING TIME TO COMPLETE THIS QUESTIONNAIRE.

PARTICIPANT CONSENT FORM

You have been asked to participate in a research study that aims to determine technological means in teaching and learning of undergraduate students in the 21st century at a Nursing Education Institution in Tshwane. The information leaflet was explained to me and an opportunity to ask questions was offered by ——————————.

You may contact **Phonia Bopape** at **081 310 9202** any time if you have questions about the research. You are invited to contact the Ethics Committee at 012 3563084 if you have any questions about your rights as a research subject. Your participation in this research is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to stop. You may withdraw from the study at any time without giving a reason. If you agree to participate, you will be given a signed copy of this document and the participant information leaflet which is a written summary of the research.

I understand what will happen to me if I participate and what my responsibilities will be. I voluntarily agree to participate.

_____

Signature of Participant **Date** _____

_____

Signature of Witness **Date**_____

ANNEXURE D: LETTERS OF APPROVAL

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Denkleiers • Leading Minds • Dikgopolo tša Dihlalefi

Faculty of Health Sciences Research Ethics Committee

DATE: 07/06/2018

Ms Phonia Nambewe PN Bopape
Dept: Nursing Science

RE: 230/2017 – Extension of Approval until 30 December 2018 and Progress Report dd 12/05/2018

The Ethics Committee of the Faculty of Health Science University of Pretoria confirms that you have been granted extension of approval for the study titled: Technological Factors Influencing Teaching And Learning Of Undergraduate Students At A Nursing Education Institution In Tshwane and was reviewed at the 30 May 2018 meeting.

For any queries you can contact the Chairperson (Prof C W van Staden) at the below mentioned telephone numbers.

With regards.

Dr R Sommers; MBChB; MMed (Int); MPharMed; PhD
Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

☎ 012 356 3085 **fhsethics.up.ac.za** http://www.up.ac.za/healthethics
✉ Private Bag X323, Arcadia, 0007 - Tswelopele Building, Level 4-59, Gezina, Pretoria

The Research Ethics Committee, Faculty Health Sciences, University of Pretoria complies with ICH-GCP guidelines and has US Federal wide Assurance.
- FWA 00002567, Approved dd 22 May 2002 and Expires 03/20/2022.
- IRB 0000 2235 IORG0001762 Approved dd 22/04/2014 and Expires 03/14/2020.

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Health Sciences Research Ethics Committee

27/07/2017

Approval Certificate
New Application

Ethics Reference No: 230/2017

Title: Technological means in teaching and learning of undergraduate students in the 21st century at a nursing education institution in Tshwane

Dear Phonia Nambewe PN Bopape

The **New Application** as supported by documents specified in your cover letter dated 20/07/2017 for your research received on the 20/07/2017, was approved by the Faculty of Health Sciences Research Ethics Committee on its quorate meeting of 26/07/2017.

Please note the following about your ethics approval:
- Ethics Approval is valid for 1 year
- Please remember to use your protocol number (**230/2017**) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, or monitor the conduct of your research.

Ethics approval is subject to the following:
- The ethics approval is conditional on the receipt of **6 monthly written Progress Reports**, and
- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

We wish you the best with your research.

Yours sincerely

*** Kindly collect your original signed approval certificate from our offices, Faculty of Health Sciences, Research Ethics Committee, Tswelopele Building, Level 4-60*

Dr R Sommers; MBChB; MMed (Int); MPharMed,PhD
Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

The Faculty of Health Sciences Research Ethics Committee complies with the SA National Act 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 and 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes, Second Edition 2015 (Department of Health).

☎ 012 356 3084 deepeka.behari@up.ac.za / fhsethics@up.ac.za http://www.up.ac.za/healthethics
✉ Private Bag X323, Arcadia, 0007 - Tswelopele Building, Level 4, Room 60, Gezina, Pretoria

Permission to access information/ Files / Data base at SG Lourens Nursing College

TO: Mrs M P Tjale

.....
The Principal /Information Officer

SG Lourens Nursing College

FROM: Bopape Phonia Nambewe

Investigator :**Bopape Phonia Nambewe**

Re: Permission to do research at ...SG Lourens Nursing College.....

TITLE OF STUDY: Technological means in teaching and learning of undergraduate students in the 21st century, at a Nursing Education Institution in Tshwane

This request is lodged with you in terms of the requirements of the Promotion of Access to Information Act, No. 2 of 2000.

I am a researcher / student at the Department of Nursing Science at the University of Pretoria

I am working with students at SG Lourens Nursing College. I herewith request permission on behalf of all of us to conduct a study on the above topic at the college grounds. This study involves access to students' records. The researchers request access to the following information: student records, registers and data bases.

We intend to publish the findings of the study in a professional journal and/ or to present them at professional meetings like symposia, congresses, or other meetings of such a nature.

We intend to protect the personal identity of the students by assigning each individual a random code number.

We undertake not to proceed with the study until we have received approval from the Faculty of Health Sciences Research Ethics Committee, University of Pretoria.

Yours sincerely

PN Bopape

Signature of the Principal Investigator

Permission to do the research study at this college and to access the information as requested, is hereby approved.

Title and name of Chief Executive Officer: MP TJALE

Name of college: SG Lourens Nursing College

Signature

Date: 22/6/2017

GAUTENG DEPT. VAN GESONDHEID
S.G. LOURENS VERPLEEGINGSKOLLEGE
Privaatsak / Private Bag X755
Official Stamp
2017 -06- 22
0001 Pretoria Tel: 012 318 9600
S.G. LOURENS NURSING COLLEGE
GAUTENG DEPARTMENT OF HEALTH

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Outcome of the provincial protocol review committee

RESEARCHER'S NAME	**PHONIA NAMBEWE BOPAPE**
ORGANIZATION/INSTITUTION	**SG NURSING COLLEGE**
RESEARCH TITLE	**TECHNOLOGICAL MEANS IN TEACHING AND LEARNING OF UNDERGRADUATE STUDENTS IN THE 21ST CENTURY AT A NURSING EDUCATION INSTITUTION IN TSHWANE**
CONTACT NUMBER	**081 310 9202**
PROTOCOL NUMBER/PROPOSAL NUMBER	**GP_2017087_034**
SITES	**SG NURSING COLLEGE**

Your permission to conduct the above-mentioned research has been reviewed by the Province and the permission has been granted.

It is requested that you submit the research report on completion of your study and present the findings and the recommendations to the Gauteng Department of Health.

YES	Permission granted

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Enquiries: Dr. Lufuno Razwiedani
Tel: +27 12 451 9036
E-mail: lufuno.razwiedani@gauteng.gov.za

TSHWANE RESEARCH COMMITTEE: CLEARANCE CERTIFICATE

PROJECT NUMBER: 96/2017
NHRD REFERENCE NUMBER: GP_ 2017087_034

TOPIC: **TECHNOLOGICAL MEANS IN TEACHING AND LEARNING OF UNDERGRADUATE STUDENTS IN THE 21ST CENTURY AT A NURSING EDUCATION INSTITUTION IN TSHWANE**

Name of the Researcher:	Phonia Nambewe Bopape
Name of the Supervisor:	Dr S.S. Moloko-Phiri
Co-supervisor:	Dr N. Mushunqane
Facility:	SG Lourens Nursing College
Name of the Department:	University of Pretoria

NB: THIS OFFICE REQUEST A FULL REPORT ON THE OUTCOME OF THE RESEARCH DONE AND

NOTE THAT RESUBMISSION OF THE PROTOCOL BY RESEARCHER(S) IS REQUIRED IF THERE IS DEPARTURE FROM THE PROTOCOL PROCEDURES AS APPROVED BY THE COMMITTEE.

DECISION OF THE COMMITTEE: **APPROVED**

.....
Dr. R. Oyedipe
Acting Chairperson: Tshwane Research Committee
Date: 20/11/2017

.....
Ms. M. Lerutla
Acting Chief Director: Tshwane District Health
Date: 22/11/17

ANNEXURE E: LETTER FROM STATISTICIAN

AGRICULTURAL RESEARCH COUNCIL

BIOMETRY

PO Box 8783, Pretoria, 0001 South Africa

Phone: (012) 427 9811 Fax: (012) 427 9743 (Int: +27 21) E-mail: NgwaneC@arc.agric.za • Web site: www.arc.agric.za

Letter of clearance

This letter confirms that **Phonia Bopape** (student no. **95288270**) studying at the University of Pretoria discussed the project titled **Technological means influencing teaching and learning of undergraduate students at a Nursing Education Institution in Tshwane** with **Cynthia Boitumelo Ngwane** (a statistician working for Biometry unit at Agricultural Research Council).

I assisted the student with determining the sample size, sampling method and data collection method. The sample size was determined using Yamen method. I will also be assisting the student through data analysis and interpretation of the results. The data analysis tool to be used will be Chi-squared test for equal proportions and association to achieve the objective of the study. All data will be analysed using SAS statistical software package.

Name Cynthia Boitumelo Ngwane **Date** 26 April 2017

Signature 

ANNEXURE F: LETTER FROM LANGUAGE EDITOR

Susanna Elizabeth Louw
Phone 076 588 8561
Email anzelle@wordfix.co.za
SATI membership number 1002866

EDITING DECLARATION

DATE: 26/10/2018

I, SE Louw, hereby declare that the dissertation titled ***Technological means in teaching and learning of undergraduate students in the 21st century at a nursing education institution in Tshwane***, with the exception of verbatim quotes, has been professionally language edited by me.

If further information is required, please contact me.

SE Louw 2018-10-26
Susanna Elizabeth Louw Date