

Readiness in technology usage by students and educators in a North West public nursing college

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Dedication

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Abstract

The use of technology has been accepted as a supplementary strategy to complement teaching and learning globally. This is in contrast with the practice locally as South Africa is still at the infant stage of the implementation of use of technology in teaching and learning especially at nursing education institutions and at public nursing colleges in rural areas in particular. Lack of information technology communication skills by nurse educators which contributes to low usage of technology in teaching and learning remains a big concern in nursing education in SA. Moreover, there seems to be a dearth in literature on the use of technology in teaching and learning at public nursing colleges precisely those in rural areas. Therefore, the aim of this study is to compare the readiness in technology usage for teaching and learning in two campuses of a North West public nursing college. This study followed a quantitative approach of a comparative descriptive design. Multi-level stratified random sampling technique was used to reach the aim of the study. Descriptive statistics data were analysed using the Statistical Package of the Social Sciences version 27. The results revealed that a North West public nursing college at Ngaka Modiri Molema district is more ready than a campus at Dr. Kenneth Kaunda district. Following the results, recommendations were made on nursing education and practice, policy makers and further research.

Key words: E-learning; Nursing; Nursing education; Nurse educators; Nursing students; Nurse training; online learning; Technology use in teaching and learning; Undergraduate nursing education.

Section 1: Research study Overview

1.1. Introduction

Despite the increased use of technology in nursing and medical practice, public nursing colleges seem to be in the beginning stage of implementing technology (Lee *et al.*, 2018:97). As Turale (2011:9) puts it, there is a huge gap in the use of technology in nursing education and health settings especially in rural areas as well as challenges regarding the nature, costs, and high turnover of technology use in teaching and learning environment. This is more prevalent in developing countries including South Africa. The purpose of this section is to outline the background and rationale of the study, problem statement, aim and objectives of the study, methodology as well as quality and ethical measures.

1.2. Background to study

The use of technology has been accepted as a supplementary strategy to complement teaching and learning globally (Yangoz, 2017:234). Included are online groupings, discussion boards, live chats and short quizzes that have become alternatives to complement traditional face-to-face teaching, learning and assessment in institutions of higher learning (McVey, 2016:126). According to McDonald *et al.* (2018:173), the use of technology in teaching and learning should be blended with a range of other methods of teaching and learning like group discussions to enhance learning. This is in contrast to the practice in South Africa (SA). At the moment, SA is still at infancy stage of the implementation of use of technology in teaching and learning. This is especially evident at nursing education institutions and public nursing colleges in rural areas, hence the need for this study. McDonald *et al.* (2018:173) highlighted that one of the many advantages of using technology in teaching and learning was that it facilitates students' self-reflection and independence.

Jamil *et al.* (2016:25), state that many students advocate for the use of technology in teaching and learning because it makes their learning fun and flexible. In other words, technology is perceived as easy to use and useful in maximizing teaching and learning (Williamson & Muckle, 2018:72). Furthermore, the authors add that the use of technology in teaching and learning allows students to work on their academic work and complete tasks quickly in their own space and time. This supports the need to undertake this current study in a sense that, the current intake at the nursing colleges is the z-generation who are known to be technologically inclined and believe in doing things remotely. However, the advantages of the use of technology in teaching and learning at a global context does not negate the fact that there are still disadvantages as well.

According to Ibrahim and AL-Khafaf (2013:5), most of the students lack skills of using computer and internet which can be associated with the fact that they do not use computers and internet continuously. In a study conducted by Jamil *et al.* (2016:25) in Seoul, a few students felt that the use of technology is not as good as it is proclaimed and that, to a certain extent, it has its own shortcomings such as making them slow in completing their tasks and that they end up dependent on it. This assertion is supported by Williamson and Muckle (2018:74) wherein they established that the use of technology might become a challenge as far as security risks, technical malfunction and information retention are concerned. Clearly, perception and readiness of use of technology in teaching and learning is dependent on the context and the technological advancement of such a context. This perception reinforces the need the need for the researcher undertake this study with the aim to assess readiness in technology usage in the under resourced North West provincial nursing education institution.

There is a general acceptance of the use of technology as an essential tool in preparation of students to cope with life and employment demands of the 21st century in the African continent (Ali, 2016:3). According to Harerimana *et al.* (2016:68) in a study conducted in Rwanda, technology in nursing education is used for various learning activities like; obtaining online resources, virtual learning, general information searching, and lesson preparation by both nurse educators and nursing students. However, the gap is that the context of this current study was at a multi-campus public nursing college which are almost always under resourced in comparison to private nursing colleges. Nonetheless, a study conducted by van Vuuren *et al.* (2018:16) highlighted that, despite some private nursing colleges having resources, they also experience difficulties in relation to optimum use of technology in teaching and learning. According to the authors, some difficulties reported were lack of formal training, unreliable sources of power, and lack of its continuous use (van Vuuren *et al.*, 2018:16). Similar to the global context, studies conducted in an African context also highlighted several advantages and challenges of the use of technology in nursing education.

In the study conducted in Rwanda, Harerimana *et al.* (2016:88) found that there are challenges facing the use of technology for teaching and learning in nursing education institutions. The challenges facing the optimum use of technology at nursing education institutions ranges from lack of technological resources and shortage of human resources trained in use of technology to poor internet connectivity and accessibility (Harerimana *et al.*, 2016:88). In addition, a study conducted by Puckree *et al.* (2015:518) suggested that access to, training and support in information communication technology (ICT) impacts their technology use for teaching and learning. Similar challenges mentioned above are applicable to the context of the present study

and in addition, many students in SA get their first ever exposure of using a computer at institutions of higher learning thus leading to difficulty in optimum use of computerised programmes for learning. As a result, this highlights the need for assessment of preparedness for the use of technology in the selected public nursing college in the province.

According to a study conducted in SA by Pete *et al.* (2017:302), the antecedents of use of technology for teaching and learning range from psychological readiness, technological readiness, and equipment readiness. In addition, use of technology requires computer accessories, internet, and connectivity in order to successfully engage in teaching and learning (Akimanimpaye & Fakude, 2015:430). This implies that simply having a device does not indicate readiness to use technology for teaching and learning. According to Harerimana and Mtshali (2019:14), use of technology by students for communication and collaboration with educators and fellow students has a positive impact on critical thinking. This finding concurs with the status quo at the selected multi-campus public nursing college in a sense that the prerequisites and the use of technology is the same across the board.

A study conducted by Akimanimpaye and Fakude (2015:427), affirms that there is a direct proportional relationship between student satisfaction and the following variables: “ i) e-learning course flexibility, ii) computer technology, iii) diversity in assessment, iv) perceived interaction with other people, and v) perceived ease of use”. Furthermore, use of technology is a convenient teaching method where there is time, distance and other constrains which make it difficult to engage in face-to-face teaching and learning (Akimanimpaye & Fakude, 2015:430). An example of such is when many institutions were forced to use technology for teaching and learning amidst the year 2020 corona virus outbreak in SA and the rest of the world when institutions of higher learning had to close their doors in an attempt curb the spread of COVID-19. Many institutions of learning particularly public nursing colleges were put onto spotlight as they were caught ill prepared to adopt the use of technology in teaching and learning in SA. Although some nursing colleges have made progress as far as provision of desktop computers to nurse educators to counter lack of access to computers (Puckree *et al.*, 2015:515).

Lack of skill by nurse educators which contributes to low usage of technology in teaching and learning remains a big challenge regarding the use of technology in nursing education in SA (Ologun, 2016:67). Thus, their lack of skills inversely impacts on the readiness to use technology by nursing students because they usually spearhead its use in teaching and learning. However, even though the aforementioned studies on the use of technology were conducted in SA, the gap is that the context varies in a sense that they were conducted at universities in the urban areas of SA. There seems to be a dearth in literature on the use of technology in teaching and learning

at public nursing colleges precisely those in rural areas. The anecdotal evidence from the researcher is that the challenges and advantages of the use of technology in nursing education in urban areas and that of universities, varies with those of public nursing colleges that are located at the rural context.

The following research problem emerged based on the background and the status quo of SA nursing education wherein public nursing colleges are supposed to migrate to higher learning as mandated by the SANC. The readiness in use of technology by nursing students and nurse educators at public nursing colleges remains a cause for concern and needs to be evaluated. Furthermore, the research problem was informed by COVID-19 pandemic that is necessitating remote teaching and learning, and the inevitable 4IR that is fast approaching. The researcher saw it befitting to undertake this current study in order to evaluate the readiness in technology usage at a selected multi-campus public nursing college.

1.3. Problem statement

Given the above background, it is clear that the use of technology in all spheres has grown exponentially to a point that robots and computerized applications are doing the day to day duties (McVey, 2016:126). According to Harerimana *et al.* (2016:89) the use of technology in teaching and learning is the future and depends on a fully functional infrastructure and collaboration among all stakeholders involved. Nursing education is not immune to the implications that are brought about by the use of technology in teaching and learning in institutions of higher learning. Several authors have also highlighted the consequences of technology use in nursing education (Bruce, 2018:47; Coopasami et al., 2017:305). According to Bruce (2018:47), technology use in nursing education has long lasting effects on the employment marketability of nursing students upon graduation. Furthermore, technology use in nurse education has a potential to facilitate a flexible self-directed learning which is a necessary critical Crossfield outcome of contemporary graduates (Coopasami et al., 2017:305).

The researcher, with an experience of being affiliated to the quality assurer body of the North West public nursing college for three years has personally witnessed a general underuse of technology in teaching and learning at the selected campuses. In addition, there seems to be a scarcity of literature on the use of technology in public nursing colleges, most studies that were conducted on “use of technology” and “nursing education” are either conducted in urban SA cities, or in the African continent, or the global context (Yangoz, 2017:234). This implies that little is known about use of technology for teaching and learning in public nursing colleges in general including the selected campuses. Furthermore, little or no information exists on the difference in

readiness in use of technology for teaching and learning in rural and urban nursing institutions, given the fact that this study will focus on a multi-campus public nursing college wherein one campus is situated at the semi-urban area whereas the other at a rural area.

Equally important, the global outbreak of COVID-19 that led to a nationwide lockdown in SA on the 26th of March 2020, forced many higher education institutions to use technology for teaching and learning as well as assessment in an attempt to save the 2020 academic year. This, more than ever, gave rise to the question of readiness in the use of technology in teaching and learning for many institutions including public nursing colleges and universities as institutions were forced to lock their gates for campus-based face to face programmes. Therefore, the researcher deemed it befitting to undertake this study with the aim to determine the readiness in technology usage by nursing students and nurse educators in a multi-campus North West public nursing college. The researcher intends to further compare the readiness in technology usage for teaching and learning by students and educators in the selected campuses given the fact that one is located at a semi-urban setting whereas the other one is located at a rural setting. The researcher acknowledges that the two institutions might be using similar modalities of teaching. However, each institution is distinct in its own way given the economic disparities due to location of each campus, and the students they recruit, which might have an impact on technology use for teaching and learning. According to Mawere *et al.* (2021:53) it is alleged that predominantly rural institutions admit learners who are incapacitated and somewhat not ready for higher education. This view is supported by Singh *et al.* (2021:5) wherein the findings of their study highlighted that that, most oftenly students from affluent backgrounds and locations stands a better chance to use technology for teaching and learning due to a better access to technology facilities like connectivity, access to own computer and others. Based on the above discussion and the fact that the two campuses had recently merged and were in their infancy stage of alignment by the time of conducting this study, the researcher saw it befitting to further compare the readiness in technology usage for teaching and learning by nursing students and nurse educators in the selected campuses.

1.4. Research Questions

According to Brink *et al.* (2018:69) a research question is a statement of the specific query derived from the research problem that the researcher intends to investigate in order to address a research problem. The authors add that the nature of the research question plays a vital role in determining the study design and methods. The research questions in this study were as follows:

- What current information exists in literature on readiness of technology usage for teaching and learning in health science education?
- How ready are the students and educators of a North West public nursing college with regard to the use of technology for teaching and learning?
- What is the difference between readiness in technology usage for teaching and learning by students and educators in the two campuses of a North West public nursing college?

1.5. Research aim and objectives

In this section, the research aim and objectives will be explained.

1.5.1. Research aim

Research aim is derived from the research problem and question. The overall purpose of the research aim is to identify, determine, explore, describe, or determine the solution to the problem (Brink *et al.*, 2018:50). In summary, research aim describes exactly what specific issues the research intends to address. Therefore, the aim of this study is to compare the readiness in technology usage for teaching and learning in the two campuses of a multi-campus North West public nursing college.

1.5.2. Research objectives

The following are the objectives of this study:

- To conduct an integrative literature review on use of technology in nursing education from 2015 to 2020.
- To determine the readiness in technology usage by students and educators in a North West public nursing college using frequency distribution statistical test.
- To compare the readiness in technology usage for teaching and learning in the two campuses of a North West public nursing college using Mann-Whitney U statistical test.

1.6. Significance of the study

According to Brink *et al.* (2018:52), significance of the study refers to how much contribution will the study add to the health fraternity in terms of practice, evidence base, and policy development. In this study, the findings may assist the department of health to understand the readiness in

technology usage for teaching and learning by students and educators in a North West public nursing college and draw a plan to enhance the usage thereof thus contributing to practice. In addition, the findings of this study may assist by closing the knowledge gap that exists on the readiness in technology usage by students and educators in the North West public nursing college by serving as a stepping stone for emerging researchers who wish to conduct research in similar or related topic(s) on the use of technology in nursing education. Lastly, the findings of this study are intended to assist the department of health to develop or update existing policies on technology usage in teaching and learning at public nursing colleges.

1.7. Definition of concepts

Nurse educator: Is defined as a professional nurse holding an additional post-basic qualification in nursing education registered with SANC (Van Dyk, 2016:11). In this study, the term nurse educators refer to a professional nurse with an additional qualification in nursing education registered with SANC and working on any campus of the North West public nursing college, teaching pre-registration programme.

Nursing student: According to philosophy and policy of South African Nursing Council (SANC) with regard professional nursing education document, a nursing student is either the student nurse in basic training or the nurse in post basic training. In this study, the student nurse refers to the student nurse in basic training following SANC regulation 425 (SANC-R425) or SANC regulation 171 (SANC-R171) at the public nursing college.

Public nursing college: Van Dyk (2016:11) defines a public nursing college as an established institution that primarily functions to train students to attain professional nursing skills. In this study, public nursing college refers to institutions registered with the department of higher education and training in SA and accredited by SANC to train nursing students to become professional nurses after acquiring professional nursing skills in the NWP.

Readiness: According to Alem *et al.* (2016:194) readiness refers to the degree to which learners are ready to take courses in an online learning environment. The authors add that learners must have prerequisite behavioural attributes, skills and orientations that will prepare them to enrol in online courses. In this study, readiness refers to the state of being prepared to use technology in teaching and learning at the selected nursing education institution by both student nurses and nurse educators.

Technology: According to Ooko (2016:xvi), technology refers to the use of high tech media such as computers, emails, internet, digital cameras, digital camcorders, software etc. In this study,

technology is defined as the use of computers, computer accessories, internet, computerized programmes and software in teaching and learning to maximise learning.

Teaching and learning: Van Dyk (2016:12) defines teaching and learning as a comprehensive transfer and acquiring of knowledge, affective, psychomotor skills and ethical principles of nursing. In this study, teaching and learning refers to a traditional and/or remote, continuous process of transfer and acquisition of information aimed at cognitive, psychomotor, and affective skills development in nursing education.

1.8. Study design

This study followed a quantitative approach of a comparative descriptive design. Quantitative research approach is used when the researcher intends to examine the relationship between variables through testing objective theories and measuring those variables on quantitative instruments for the purpose of statistical data analysis (Creswell, 2014:4). According to Brink *et al.* (2018:97), comparative descriptive design is a type of quantitative research design that is used when the researcher intends to describe the variables and the differences between two or more groups. The authors add that comparative descriptive design is also used when the researcher further intends to analyse the nature of the differences which exists among those groups using descriptive and inferential statistics to make such analyses. The rationale for the choice of this design is that, as described by Brink *et al.* (2018:97), the researcher intends to describe the variables namely; the use of technology and teaching and learning. Furthermore, the rationale for choice of the design was that the researcher further intended to describe the differences in the variables mentioned earlier between the two groups, in this case the North West public college campuses. In this study, comparative descriptive design was used to describe the readiness in technology usage for teaching and learning by students and educators in a North West public nursing college. The researcher then determined if there is any statistically significant difference in readiness to use technology for teaching and learning by educators and students at the selected campuses, and if any, compare such differences. Therefore, given the aforementioned rationale, comparative descriptive design was the research design of choice.

1.9. Research methods

In this section, study methods are explained as follows: study context, population and sampling, recruitment of participants, process of obtaining informed consent, data collection, and data analysis.

1.9.1. Study context

The study was conducted in the NWP which is one of the nine provinces in SA. The province is predominantly rural and constitutes four districts namely, Bojanala District (BD), Dr Kenneth Kaunda District (Dr KKD), Ngaka Modiri Molema District (NMMD), Dr Ruth Segomotsi Mompati District (Dr RSMD). The study was conducted in a North West multi-campus public nursing college consisting of two campuses which are situated in both Dr KKD and NMMD. The North West multi-campus public nursing college comprises two campuses which employ a total of forty nurse educators with a total of five hundred and ninety-seven pre-registration nursing students distributed in the two campuses. The campuses are divided by the districts they cater for. Dr KKD campus predominantly caters for Dr KKD and BD whereas NMMD campus primarily caters for NMMD and Dr RSMD. Lastly, Dr KKD campus is located in a semi-urban area while NMMD campus is situated in a rural area thus leading to disparities concerning structural development. The rationale for including North West public nursing college was based on the fact that, the province is predominantly rural which translates to lack of development and resource allocation. Additionally, there seems to be a paucity in literature on studies conducted at public nursing colleges, especially from the rural areas like North West province on topics related to the use of technology in nursing education. Therefore, North West public nursing college is of interest to the researcher as it opens doors for more researchers who would like to conduct studies in related topics in any other public nursing college in SA.

1.9.2. Sampling process

According to Taherdoost (2016:19), the sampling process encompasses the following stages: clearly defining target population, selecting sampling frame, choosing sampling technique, determining the sample size, collection of data, and assessment of response rate. This study was guided by the aforementioned sampling process and the following will be discussed in this section: population, sampling frame, sampling technique, sampling size, inclusion criteria, and exclusion criteria.

1.9.2.1. Population

The target population is the entire set of a population of interest to the researcher which the researcher intends to make a generalization from (Brink *et al.*, 2018:116). In this study, there were two sets of populations of interest to the researcher. The first target population was nurse educators employed at the North West public nursing college. The second target population was

pre-SANC registration nursing students in a North West public nursing college pursuing SANC-R425 and SANC-R171 qualification.

1.9.2.2. Sampling frame

Taherdoost (2016:20) defines a sampling frame as a list of cases that will be drawn from the population, that are a true representation of the population to make up a sample. In this study, the sampling frame for nursing students per study level (1st to 4th year) in each campus was determined by multiplying the proportion of nursing students per level of study by the sample size on each campus. The sampling frame for nurse educators was the total population of nurse educators in each campus according to the sampling technique that is explained below.

1.9.2.3. Sampling technique

This study used a multi-level stratified random sampling technique whereby the North West public nursing college was initially divided into regions known as strata, namely the two campuses. This was followed by further stratifying the nursing students in each campus, and lastly obtaining a sample using random sampling in each stratum. According to Thompson (2012:141), a stratified random sampling is a technique wherein the entire set of population is initially divided in to sub-groups called strata, followed by using simple random sampling in each stratum to obtain a sample.

Stratified random sampling is a technique of choice when the researcher wishes to ensure that the sample is spread out over the total population and is a representation of such population (Thompson, 2012:141). To illustrate, North West public nursing college was sub-divided into two strata namely the NMMD campus and Dr KKD campus. In each campus, the researcher stratified pre-SANC registration nursing students according to the level of study in each campus namely: first, second, third-, and fourth-year nursing students as strata because they share common traits. Following stratification, the researcher then used convenience sampling in each stratum at NMMD and Dr KKD campuses respectively to obtain the sample for inclusion in the study (*See table 1.1*).

The researcher, through the mediator, contacted the class representatives in each level to assist with distribution of the link to the questionnaire in their respective Whatsapp groups or emails. The researcher then sent out the link to the questionnaire with the class representatives who shared it to their respective class mates on their platform of communication. Thus, using convenience sampling technique because the questionnaire was conveniently sent out to all the nursing students in each class.

The total population of nurse educators was used due to the small population of nurse educators at each campus respectively.

1.9.2.4. Sample size

The Raosoft sample size calculator was used to determine the sample size. According to Brink *et al.* (2018:128), sample size calculators are used in quantitative probability sampling studies when the researcher calculates the acceptable number of participants needed in the study and to also determine the acceptable sampling error. An acceptable margin error was set at 5%, with a confidence level of 95%, and response distribution at 50%. The total population at the North West public nursing college at NMMD is as follows: Nurse Educators (n=20), first year nursing students (n=50), second year nursing students (n=76), third year nursing students (n=150), and fourth year nursing students (n=58). The total population at North West public nursing college at Dr KKD as follows: Nurse Educators (n=20), first year nursing students (n=50), second year nursing students (n=56), third year nursing students (n=95), and fourth year nursing students (n=62).

The total population of students is thus 597 comprising 334 from NMDD campus and 263 from Dr KKD campus. This implies that the proportions of students to be selected from the population are $(334/597)*100=55.946\%$ and $(263/597)*100=44.054\%$ for the campus at NMDD and Dr KKD respectively.

The sample size for the population size of 597 according to the Raosoft calculator is 234. This implies that the sample sizes are $0.55946*234=131$ and $0.44054*234=103$ students from the campus at NMDD and Dr KKD respectively.

Table1 depicts the proportion of students that need to be selected from each study level (p) and is computed as follows: the sample size per study level in each campus is determined by multiplying the proportion (p) by the sample size for each campus.

$$p=n/N$$

$$r=p*S$$

Where n is the number of students in each study level, N is the total population for each campus, r is the sample of students in each study level, and S is the sample size at each campus.

Table 1.1 depicts the proportions of nursing students selected from each level of study.

Table 1. 1: Proportions of students to be selected from each study level

NMMD Campus			
Level of study	Population	Proportion (n/N)	Sample
First Years	50	$50/334 = 0,150$	$0,150*131 = 20$
Second Years	76	$76/334 = 0,228$	$0,228*131 = 30$
Third Years	150	$150/334 = 0,449$	$0,449*131 = 59$
Fourth Years	58	$58/334 = 0,174$	$0,174*131 = 23$
Total	334	1,000	131

Dr KKD campus			
Level of study	Population	Proportion (n/N)	Sample
First Years	50	$50/263 = 0,190$	$0,190*103 = 20$
Second Years	56	$56/263 = 0,213$	$0,213*103 = 22$
Third Years	95	$95/263 = 0,361$	$0,361*103 = 37$
Fourth Years	62	$62/263 = 0,236$	$0,236*103 = 24$
Total	263	1,000	103

Convenience sampling technique was used to select students from each stratum and to also avoid sampling bias as described under sampling frame.

1.9.2.5. Inclusion and exclusion criteria

The following tables describe the inclusion and exclusion criteria for both nursing students and nurse educators.

1.9.2.5.1. Inclusion and exclusion criteria for nursing students

Table 1.2 depicts inclusion and exclusion criteria of the students as participants in this study.

Table 1. 2: Inclusion criteria and exclusion criteria for nursing students

Inclusion criteria	Exclusion criteria
Pre-SANC registration nursing students from North West public nursing college registered for the year 2021 following SANC-R425/R171 program. The rationale for this criterion is that the researcher was interested in	Post-SANC registration nursing students including bridging nursing students at North West public nursing college. The rationale for exclusion is that, post-SANC registration nursing students might be either one year,

nursing students with first time exposure to post matric education.	distant, or have a different teaching approach which might yield different results.
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1.9.2.5.2. Inclusion and exclusion criteria for nurse educators

Table 1. 3 depicts the inclusion and exclusion for the nurse educators as participants in this study

Table 1. 3: Inclusion and exclusion criteria for nurse educators

Inclusion criteria	Exclusion criteria
<p>Nurse educators employed at North West public nursing college and involved in teaching and learning of pre-SANC registration nursing students.</p> <p>The nurse educators must have an additional nursing education qualification registered with SANC with at least 6 months teaching experience at the selected public nursing colleges to be able to give a clear picture of the readiness in technology usage at the said public nursing college.</p>	<p>Clinical preceptors and accompanists who are based at the clinical facilities. The rationale for excluding them is that they are not fully in contact with the North West public nursing college, therefore they might not be fully aware of the entire operations of the selected campuses as they are stationed at the clinical facilities.</p>

1.10. Recruitment of participants and informed consent

The entire recruitment process was done between lockdown alert levels three and a lower level of SA COVID-19 risk adjusted strategy to curb the spread of COVID-19. In addition, the following health guidelines were adhered to whenever there was an interaction with participants; Social distancing of at least two metres, provision of 80% alcohol-based hand sanitizer and regular hand sanitization, wearing of a cloth face mask or a cloth that covers both nose and mouth, disinfecting all working spaces with 80% alcohol-based disinfectant, referral system for those who might be asymptomatic and develop symptoms in the process of recruitment. Furthermore, the researcher had a COVID-19 toolkit that comprised the following items: researcher's face mask, masks for participants, thermometer, 80% alcohol-based hand sanitizer, sanitizer for surfaces, box of tissue paper for cough etiquette, red plastic for disposing used tissues and masks. Lastly, the research team comprised nurses who are aware of the signs and symptoms of COVID-19. However, a small refresher session was held to ensure proper preparation and clarification of the process.

The researcher approached the gatekeepers and requested a meeting at each North West public nursing college, i.e., campus heads, to give both verbal and written short presentation on the project and to also request permission to access the potential participants. Contact with potential nurse educators' participants took place at their individual offices whereas contact with potential nursing students' participants took place at their classrooms. The aforementioned health guidelines were employed to minimize the spread of COVID-19 during interaction with participants despite the daily routine screenings at the entry points at the selected campuses. Therefore, all participants had to answer no to the following questions before interaction with the researcher or research team; do you have a cough? do you have a sore throat? do you have shortness of breath or any breathing problems? do you have difficulty in smelling or tasting?

The researcher requested permission from the gatekeepers to place the pamphlet at the notice boards at the selected campuses during block sessions in accordance with their institutional communication policies. In addition, the researcher made use of pamphlets (*see annexure C*) following a word-of-mouth approach to recruit potential participants. Neutral recruitment of potential participants, both nursing students and nurse educators, was done by a mediator, a human resource personnel to avoid undue influence of participants.

The researcher requested five minutes for presentation of aim and objectives of the study at staff meetings and classes at each campus to introduce the study. Following the short presentation, nursing students were recruited at their respective campuses during block weeks, the target timing was during break times to avoid interfering with their studies. The recruitment of potential participants included mainly short presentation on what the study is about, and what could be expected from the potential participants. All guidelines of the management of COVID-19 guidelines as alluded to earlier, were observed during this phase of interaction. Nursing students were approached individually and not in a group in an attempt to protect their privacy and confidentiality. For nurse educators, recruitment was done on the agreed date with the gatekeeper. Nurse educators were also targeted during lunch times in their respective offices to ensure privacy and confidentiality.

A quick presentation of the study and what was expected of the potential participants was done, the researcher then left contact details for those who were interested in participating in the study. The consent form was negotiated through the use of an independent research assistant who does not have any power relation with both educators and students at a North West public nursing college to avoid coercion of participants. The researcher explained all aspects of a consent form (*Annexure B*) to the independent research assistant through *Google meet* to keep him abreast with the consent form prior negotiating with potential participants. The independent research

assistant in this study has the experience in negotiating informed consent and he is currently a PhD student at NWU thus has enthusiasm and competency to positively influence the recruitment process.

Electronic informed consent was obtained voluntarily from the participants without coercion, undue influence, or inappropriate incentives. The process of obtaining informed consent was done prior data collection. The detailed electronic informed consent was attached to the questionnaire as the initial section and had the “Do you want to participate in the study?” question. The answer to that question, either “yes” or “no” determined participation to the study. A link to the informed consent that was part of the questionnaire was shared either through WhatsApp or email depending on the participants’ preference. To ensure an informed consent, potential participants were allowed a maximum of fourteen (14) days to peruse the electronic consent form prior accepting or declining. For participants who agreed to be part of the study, they were prompted to click on “yes” and were directed to continue to section B until section C of the questionnaire. For participants who opted not to participate, they clicked on “no” and they were directed to the last section where it says, “participation declined”.

Participants were informed that they had the right not to participate, and if they chose to participate in the study, they could withdraw at any time without any penalisation. There was no inappropriate incentive for completing the consent form, however participants were provided with fifty megabytes data should the need arise to communicate. The obtained informed consent was further confirmed by the researcher to ensure that proper ethical measures, as stipulated in this paper, were adhered to.

1.11. Data collection

In this section, data collection tool, its validity and reliability and data collection process is discussed.

1.11.1. Data collection tool

The researcher adapted a self-administered questionnaire that was developed by Mohammed (2019:6) on “E-learning Readiness from Perspectives of Medical Students: A Case Study of University of Fallujah” (see *Annexure J*). The adapted questionnaire was used for data collection among the nursing students and nurse educators (see *Annexure A*). A questionnaire is described by Brink *et al.* (2018:138) as an electronic or printed document comprising questions to be responded to by the unit of analysis. Therefore, a self-administered questionnaire is a type of questionnaire wherein the participants personally complete the questionnaire (Bryman *et al.*,

2014:191). According to Bryman *et al.* (2014:191) and Brink *et al.* (2018:139) a questionnaire is cheaper and quicker to administer in comparison to interviews and other data collection methods. Additionally, questionnaires are convenient to participants, ensure participants' anonymity thus encourage them to provide accurate answers, they can easily be tested for reliability and validity, and the standard format remains the same for all participants.

In this study, the researcher chose to use self-administered questionnaires because data were collected in a large group of participants and the researcher sought to protect participants' anonymity throughout the data collection process. Furthermore, given the current threat of COVID-19 pandemic, the questionnaire assisted by limiting contact from person to person as it could be completed individually by the participants in their own space. The questionnaire was coupled with informed consent as a single online document. The questionnaire consisted of six sections namely; informed consent, socio demographic data, attitudes towards the use of technology in teaching and learning, content and culture readiness among educators and students, technology readiness among educators and students, and participation declined. The questionnaire took a maximum of 20 minutes for participants who accepted the questionnaire by clicking on "yes" in the first section which is the informed consent. For those who clicked on "no", they were not be able to fill in the questionnaire and as a result were automatically exited by either submitting the form without having completed the questionnaire or by simply closing their web browser.

1.11.1.1. Validity and reliability of data collection

This study adapted a data collection tool that was developed by Mohammed (2019:6) on "E-learning Readiness from Perspectives of Medical Students: A Case Study of University of Fallujah" which had a Cronbach alpha of 0,913 and is deemed reliable. Cronbach alpha is defined by Heo *et al.* (2015:2) as a sum of covariance between item scores and its values ranges between zero and one with one being the greatest value. Therefore, a Cronbach alpha of a greater value implies smaller measurement error and greater statistical power thus reliability (Heo *et al.*, 2015:8). However, the researcher did not rely on the aforementioned Cronbach alpha value because the tool was adapted to suit the current study context. To ensure the validity and reliability of the adapted self-administered questionnaire referred to above, the researcher conducted a pilot study with a fraction (10%) of the sample size to test if the data collection tool was testing what it is supposed to test, and to check how the units of analysis interpret the questionnaire in the context of this present study. Following a pilot study, internal consistency of the tool was measured using Cronbach alpha within the statistical package for social sciences

(SPSS) version 27. The data collection tool was amended as per the similarity index within Cronbach alpha, and the obtained value was the Cronbach alpha value in this study (0.920).

Reliability Statistics

Cronbach's Alpha	N of Items
.920	45

Cronbach Alpha value of the data collection tool

1.11.2. Data collection process

The researcher ensured that all nursing students and nurse educators complied with the inclusion criteria as set out in this study. After ensuring that voluntary informed consent was obtained from participants by following measures outlined in the process of obtaining informed consent, the data collection process began. The two sets of population referred to in the population section in this study were approached at different intervals for an information session at their respective campuses. Data were collected by sharing and completing the questionnaire online using *google docs*' link (<https://forms.gle/L4ekYcYdmUCsA4pQA>) that was shared by the researcher with participants either through *WhatsApp* or e-mail depending on their preference. The rationale for the preference of online data collection method was mainly to minimize contact when handing over questionnaires and the risk that handling of questionnaires poses between persons during this era of COVID-19. Electronic feedback from the participants was received through *Google Docs on Google Drive*.

The process of data collection was completely online. As a result, there was no need to arrange facility for data collection. After having acclimatised themselves with the informed questionnaire at the end of fourteen days, participants started filling in the questionnaire. The initial step was to click on "yes" at the first section to allow the participant to access the questionnaire. By clicking on "yes", it indicated that the participant had granted informed consent to participate in the study. Participants who granted informed consent filled in from section B to section D of the questionnaire and were allowed to submit the form. For participants who did not grant informed consent, they were not able to fill in consent form and as a result they were directed to the last section as discussed earlier. All measures to curb the spread of COVID-19 as outlined in this paper were adhered to throughout the data collection process.

Data were obtained from the sample of students per stratum that was obtained through convenience sampling technique as explained above. For nurse educators, data were obtained from total population of nurse educators at each campus. The process of data collection was entirely electronic as explained earlier. This process further ensured protection of participants' anonymity and privacy because electronic responses were sent at the participants' convenience and were received as complete anonymous responses.

The type of data that were collected from participants were on the readiness in technology usage for teaching and learning by students and educators in a multi-campus North West public nursing college as set out in the questionnaire (*see annexure A*). The collected data were used to describe and compare the readiness in technology usage for teaching and learning by students and educators in a multi-campus North West public nursing college. Data were only collected for the purpose of this study and were not shared with any other unauthorised persons other than the researcher, supervisors, and the statistician. Questionnaires were filled in anonymously and did not require any identifying information from participants, thus reinforcing anonymity and confidentiality.

1.12. Data analysis

SPSS V27 was utilized to analyse descriptive statistical data. Brink *et al.* (2018:166) describe statistical data analysis tools as the most powerful tools for quantitative data analysis that allow the researcher to communicate quantitative data through manipulating, organizing, and summarising quantitative data. In this study, the researcher used different statistical tests for different analyses of data to achieve different objectives. To elaborate, the researcher used frequency distribution test to determine the readiness in technology usage by students and educators in a North West public nursing college. Following that, the researcher used Mann-Whitney U statistical test to compare the readiness in technology usage for teaching and learning in the two campuses of a North West public nursing college. A frequency table was used to summarise the demographic variables. Following the reliability test, the responses per construct were presented in pie charts. Analysed data was stored for a period of five years from the date of completion of the study as per the NWU data management policy and for quality assurance purposes. Computed data are kept safe in a password protected document in the researcher's personal computer. Only the researcher, supervisors, and statistician have access to data. Data is managed by the researcher and was not shared with anyone else other than the supervisors and statistician unless ordered by the court of law to do so. Data were therefore, used for purposes agreed to by the participants when they gave consent to participate. Data will be destroyed by means of deleting computed data and emptying recycle bin after five years of storage.

1.13. Ethical considerations

The following section discusses ethical considerations under the following sub-headings: probable experience of participants, anticipated benefits, risk benefits ratio, experiences of researchers, legal authorisation, goodwill permission, participants' recruitment and informed consent, vulnerable participants, respect for participants, confidentiality and anonymity of participants, data management, dissemination of results, and conflict of interest.

1.13.1. Probable experience of participants

Participants in this study were nurse educators and nursing students. Nursing students hold a matric certificate with either admission to diploma or bachelors' degree. They are currently studying to become professional nurses either following SANC-R425 which is phasing out or SANC-R171 which phased in effective from the year 2020. Nursing student participants in this study varied in terms of their year of study and thus their level of experience.

The other group of participants in this study were nurse educators who are registered nurses as per SANC and have an additional qualification in nursing education registered by SANC. Nurse educators in this study had the experience of teaching nursing student following the aforementioned SANC regulations.

1.13.2. Anticipated benefits

There were no direct benefits to participants. However, the indirect benefit of this study was that the findings might assist policy makers to amend the policies with regard the use of technology by nursing students and nurse educators in public nursing colleges in general, including North West public nursing college. This study might further benefit future researchers who would like to conduct studies on a similar topic(s) as it would serve as a trigger for future research. Lastly, it was anticipated that this study may further benefit the society at large in a sense that it may play a big role in closing the gap of use of technology for teaching and learning at public nursing colleges thus improving the quality of nursing education and subsequently patient care at large.

1.13.3. Risk/benefit ratio analysis

Table 4 below depicts the risk and precaution measure in this study. Analysis of risks and benefits will be discussed below.

Table 1. 4: Risks and precaution measures

1.13.4. Experience, skills, and competency of researcher(s)

The researcher is a holder of Bachelor of Nursing Science (BNSc), Bachelor of Nursing in Education (BN-Edu), and Advanced university diploma in health service management. The researcher worked as a professional nurse in NWP and currently works as a nursing simulation lab manager at a higher education institution in NWP (not the same institution as where the research is intended to take place). The researcher holds a North West University health research (NWU-HREC) ethics certificate obtained in 2019 with the following ethics number: NWU-02071-20-A1.

The supervisor is a registered nurse educator and nurse manager with a Master of Nursing Science as his highest degree obtained. The supervisor has worked as a professional nurse in NWP and currently works as a nurse educator at an institution of higher learning in NWP. The supervisor has undergone ethics training provided by NWU-HREC in 2018.

The co-supervisor is a PhD holder and associate professor at an institution of higher learning in NWP. She is a mixed methods researcher. The co-supervisor has also undergone ethics training and forms part of the ethics committee of the NWU.

The statistician is an associate professor at the Business and Statistics department at NWU Mahikeng campus. The researcher used the statistician for consultation services from conceptualization to completion of the study for support in the following: 1) questionnaire design and adaptation; 2) selection of appropriate statistical tools; 3) data compiling and decoding; 4) interpretation of statistical output; and 5) presentation of tables and figures according to the journal guidelines.

1.13.5. Legal authorisation

The researcher sent the research proposal to the NuMIQ scientific review committee for review of scientific integrity. Upon approval by the NuMIQ scientific review committee, the study was then sent to the NWU Faculty of Health Sciences Health Research Committee (NWU-HREC) to ensure that ethical measures were adhered to and for ethical approval before the data collection process. After approval by NWU-HREC, the researcher proceeded to file an online application for ethical approval by the NW department of health. Lastly, after approval of all the above processes, the researcher requested authorization from the college principals to recruit and collect data from the potential participants. The college principals are gatekeepers at the North West public nursing colleges and have authority to grant access to both nurse educators and nursing students.

1.13.6. Goodwill permission / consent

Goodwill permission was sought from the relevant stakeholders post legal authorisation. For this study, the initial gatekeeper was the NWU for ethical approval of the study through NWU-HREC. Then the researcher sourced goodwill permission from NW Department of Health to have access to North West public nursing colleges. For access to nurse educators and nursing students, goodwill permission was sought from the North West public nursing college campus principals as the gatekeepers. Lastly, the respondents also participated autonomously in the study, and they had to sign a consent form to show that they agreed to participate without coercion.

1.13.7. Vulnerable participants

Nursing students are not classified as vulnerable participants by Health (2015:23) document of research ethics. However, Al-Hinai (2018:75) and Ferguson *et al.* (2004:54) emphasise that conducting research with students may create power imbalance especially when researcher has dual roles both as an educator and researcher. This may result in undue influence and power differentials affecting the students' decision of whether to participate or not. The power imbalance results because students are dependent on the researcher and educator for learning outcomes and grades. In this context, the researcher was not involved in the teaching and learning activities at any of the North West public nursing colleges. Therefore, there were no power relations between the researcher and participants in this current study. To further avoid unintended coercion and undue influence, the researcher declared the study to the North West public nursing college campus principals who are the gatekeepers. The gatekeepers identified the mediator for recruitment of participants and negotiation of consent to create neutrality. The mediator used recruitment material provided by the researcher for recruitment and was requested to sign the NWU standard confidentiality form.

1.13.8. Respect for participants

Participants were given consent forms to allow them to make an informed voluntary consent to participate in the study thus respecting their autonomy. Participants were informed that they had the right to terminate their participation in the study without any punishment whatsoever. Lastly, participants were given fourteen days to go through the consent form prior accepting and agreeing to participate in the study.

1.13.9. Measures to ensure confidentiality and anonymity of participants

The study used a questionnaire as a data collection tool. According to Brink et al. (2018:139), one of the advantages of using questionnaire is that it ensures anonymity of participants. To elaborate, participants were not required to give out any identifying information in the questionnaire like their names to further ensure anonymity. Both the mediator and research assistant were required to sign a standard NWU confidentiality form attached (see Annexure D) that was binding them to uphold confidentiality at all costs. Copies of soft data are password protected and kept in the researcher's computer to prevent access by any other unauthorised persons other than the researcher, supervisors, and the statistician. Data is kept for a period of five years and completely destroyed thereafter. Data were accessed by the researcher, supervisors, and the statistician for data analysis. Lastly, the researcher followed the prescripts of Protection of Personal Information Act (POPIA) no.43 of 2016 to further ensure confidentiality and anonymity of participants in this study.

1.13.10. Reimbursement of participants

There was no payment for participating in this study. The reimbursement of participants was guided by time, inconvenience, and expenses (TIE) principle. In this study, there was no reimbursement of participants as there was minimum inconvenience and no expenses involved from the participants. In cases where participants used their data bundles to fill-in questionnaire online, reimbursement was done at the acceptable rates to avoid coercion or undue influence of participants.

1.13.11. Dissemination of research results

The results of the study were disseminated on completion of the study to the participants, peers, and the public. The results were disseminated through article publication, conference presentation, press release, and informing participants personally. The findings of the study were further disseminated through pamphlets and a research report directed to the North West Department of Health as the gatekeeper. Furthermore, the findings were disseminated to training and education by keeping a copy of the complete dissertation at the NWU library and through presentations to the participants.

1.13.12. Conflict of interest

The researcher declared no conflict of interest whatsoever with regard this study as the researcher is not in anyhow, connected to the routine teaching and learning at any of the multi-

campus North West public nursing college which could have resulted in bias of conducting the study or reporting of findings.

1.14. Research report structure (article format)

This study will follow an article format as outlined below:

Section 1: Overview of the study

Section 2: Articles on the findings

Article 1: Integrative literature review article (Published at *Curationis journal*)

Article 2: Article (Published at *Health SA Gesondheid journal*)

Section 3: Conclusion, limitations, and recommendations

1.15. Summary of section 1

This section described the overview of the study. The overall aim and objectives of the study were discussed including the research design and methods used by the researcher to answer the research questions. Furthermore, the ethical principles were described in detail according to the way they were followed in the study.

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SECTION 2: MANUSCRIPTS

2.1. Introduction

The researchers followed an article format in this present study. The articles were guided by the objectives as outlined in Section 1. Two articles, integrative literature review and empirical manuscript, were written in order to achieve the objectives. On the one hand, integrative literature review manuscript addressed the first objective and on the other hand, the two other objectives were addressed in the empirical manuscript. The researchers followed the author guidelines for *Curationis* journal when preparing the integrative literature review manuscript. For empirical manuscript, *Health SA Gesondheid* journal author guidelines were followed. Both manuscripts are part of section 2 as they depict the findings in this study.

The presentation of this section is thus structured as follows:

Manuscript 1 - Technology usage for teaching and learning in nursing education: An integrative review

Curationis journal author guidelines

Proof of submission or acceptance or publication

Manuscript

Manuscript 2 - Technology usage for teaching and learning in a multi-campus North West public nursing college

Health SA Gesondheid journal author guidelines

Proof of submission or acceptance or publication

Manuscript

2.2. Manuscript 1

2.2.1. Appendix A: Curationis journal author guidelines

The researcher followed Curationis author guidelines when preparing the below manuscript. The guidelines are attached below, and also available at https://curationis.org.za/index.php/curationis/pages/view/submission-guidelines#part_1

Full structure

- Original Research Article

Overview

The author guidelines include information about the types of articles received for publication and preparing a manuscript for submission. Other relevant information about the journal's policies and the reviewing process can be found under the about section. The **compulsory cover letter** forms part of a submission and must be submitted together with all the required [forms](#). All forms need to be completed in English.

Original Research Article

An original article provides an overview of innovative research in a particular field within or related to the focus and scope of the journal, presented according to a clear and well-structured format.

Word limit	7000 words (excluding the structured abstract and references)
Structured abstract	250 words to cover a Background, Objectives, Method, Results and Conclusion
References	60 or less
Tables/Figures	no more than 7 Tables/Figure
Ethical statement	should be included in the manuscript
Compulsory supplementary file	ethical clearance letter/certificate

Corrections

A correction provides the platform to communicate important, scientifically relevant errors or missing information in a published article. Any changes after publication that affect the scientific interpretation (e.g., changes to a misleading portion of an otherwise reliable publication, an error in a figure, error in data that does not affect conclusions or addition of missing details about a method) are announced using a Correction. Read our submission procedure for [corrections](#) and [publishing policies](#).

Compulsory title	The title of the submission should have the following format: 'Corrigendum: Title of original article'.
Submission File	completed Correction Submission Form (required)
Compulsory supplementary file	any supporting documents or emails, Author Change Request Form (if applicable), Corresponding Author Change Request Form (if applicable)

Cover Letter

The authorship, disclosure statements, copyright, and license agreement form is our compulsory cover letter which needs to form part of your submission. Kindly download and complete, in English, the provided [form](#).

Anyone that has made a significant contribution to the research and the paper must be listed as an author in your cover letter. Contributions that fall short of meeting the criteria as stipulated in our policy should rather be mentioned in the 'Acknowledgements' section of the manuscript. Read our [authorship](#) guidelines and [author contribution](#) statement policies.

Original Research Article full structure

Title: The article's full title should contain a maximum of 95 characters (including spaces).

Abstract: The abstract, written in English, should be no longer than 250 words and must be written in the past tense. The abstract should give a succinct account of the objectives, methods, results and significance of the matter. The structured abstract for an Original Research article should consist of five paragraphs labelled Background, Objectives, Method, Results and Conclusion.

- **Background:** *Why do we care about the problem?* State the context and purpose of the study. (What practical, scientific or theoretical gap is your research filling?)
- **Objectives:** *What problem are you trying to solve?* What is the scope of your work (e.g. is it a generalised approach or for a specific situation)? Be careful not to use too much jargon.
- **Method:** *How did you go about solving or making progress on the problem?* State how the study was performed and which statistical tests were used. (What did you actually do to get the results?) Clearly express the basic design of the study; name or briefly describe the basic methodology used without going into excessive detail. Be sure to indicate the key techniques used.
- **Results:** *What is the answer?* Present the main findings (that is, as a result of completing the procedure or study, state what you have learnt, invented or created). Identify trends, relative change or differences on answers to questions.
- **Conclusion:** *What are the implications of your answer?* Briefly summarise any potential implications. (What are the larger implications of your findings, especially for the problem or gap identified in your motivation?)

Do not cite references and do not use abbreviations excessively in the abstract.

Introduction: The introduction must contain your argument for the social and scientific value of the study, as well as the aim and objectives:

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Technology usage for teaching and learning in nursing education: An integrative review

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Background: The increasing availability of technology devices or portable digital assistant devices continues to change the teaching-learning landscape, including technology-supported learning. Portable digital assistants and technology usage have become an integral part of teaching and learning nowadays. Cloud computing, which includes YouTube, Google Apps, Dropbox and Twitter, has become the reality of today's teaching and learning and has noticeably improved higher education, including nursing education.

Objectives: The aim of this integrative literature review was to explore and describe technology usage for teaching and learning in nursing education.

Method: A five-step integrative review framework by Whittemore and Knafl was used to attain the objective of this study. The authors searched for both empirical and non-empirical articles from EBSCOhost (health information source and health science), ScienceDirect and African Journals Online Library databases to establish what is already known about the keywords. Key terms included in literature search were *coronavirus disease 2019 (COVID-19)*, *digital learning*, *online learning*, *nursing*, *teaching and learning*, and *technology use*.

Results: Nineteen articles were selected for analysis. The themes that emerged from this review were (1) technology use in nursing education, (2) the manner in which technology is used in nursing education, (3) antecedents for technology use in nursing education, (4) advantages of technology use in nursing education, (5) disadvantages of technology use in nursing education and (6) technology use in nursing education amidst COVID-19.

Conclusion: Technology in nursing education is used in both clinical and classroom teaching to complement learning. However, there is still a gap in its acceptance despite its upward trend.

Contribution: The findings of this study contribute to the body of knowledge on the phenomenon of technology use for teaching and learning in nursing education.

Keywords: COVID-19; digital learning; online learning; nursing; teaching and learning; technology use.

Introduction

Technology devices, such as smartphones, have become the first and the last thing that human beings interact with on a daily basis (Alsayed, Bano & Alnajjar 2020:244). Consequently, the authors add that this has created a strong bond between human beings and their technology devices (Alsayed et al. 2020:244). The increasing availability of technology devices or portable digital assistant (PDA) devices continues to change the teaching-learning landscape, including but not limited to technology-supported learning (Forehand, Miller & Carter 2017:51). The use of technology makes learning fun and exciting, and it cuts across all disciplines including nursing education (Forehand et al. 2017:51). Technology usage in teaching and learning has risen to its peak recently given the current coronavirus disease 2019 (COVID-19) pandemic and its social distancing protocols. Higher education institutions including nursing education institutions globally have resorted to online learning to continue teaching and learning amidst COVID-19 pandemic.

Technology usage plays a vital role in the facilitation of learning in higher education institutions (Al-Hariri & Al-Hattami 2017:84). Portable digital assistants and technology usage have become an integral part of contemporary teaching and learning (Hashim 2018:2). The authors add that cloud computing, which includes YouTube, Google Apps, Dropbox and Twitter, has become the reality of today's teaching and learning and has noticeably improved higher education, including nursing education. Similar to the context of this review, technology seems to be the backbone of

teaching and learning wherein information searching, teaching and learning, and assessment are all reliant on technology. Students mainly use technology and technology devices for web browsing and class preparation and to document and record class proceedings for referral (Alsayed et al. 2020:243). Several studies have highlighted the benefits of technology usage in nursing education that is associated with its exponential growth (MacKay, Anderson & Harding 2017:3; Márquez-Hernández et al. 2020:5; Subedi et al. 2020:73).

According to Subedi et al. (2020:73), technology use in teaching and learning is flexible, minimises travelling and thus is cost-effective, and it allows family time as classes can be attended at the comfort of one's home. However, some perceive the home environment as disruptive and less conducive for teaching and learning. The benefits of technology usage in teaching and learning are not only limited to classroom setting or theoretical aspect of nursing education. In a study conducted by Mackay Anderson and Harding (2017:3) and Márquez-Hernández et al. (2020:5), students reported that technology and PDAs allow them to have access to a range of websites that enables them to make on-the-spot and sound clinical decisions when placed at clinical facilities for work-integrated learning (WIL). Furthermore, integration of technology usage with clinical settings has proven to be the driver of innovative ideas in making sound clinical decisions (DiMattio & Hudacek 2020:4). Despite the notable benefits of technology use for teaching and learning in nursing education, there are still challenges that face this fast-growing modality of teaching and learning.

There are still nurse managers and educators who feel that technology usage in nursing education is disruptive, especially when used at clinical settings (Alsayed et al. 2020:244). Some nurse educators prefer traditional teaching and learning than technology usage in teaching and learning (Al-Hariri & Al-Hattami 2017:84). In addition, hardware and software issues, connectivity, security and safety of personal information, and lack of face-to-face interaction are some other challenges facing optimum use of technology in teaching and learning (Dhir et al. 2017:875). Furthermore, non-proficiency regarding the use of Information and Communication Technology (ICT) and PDAs is also a challenge for technology usage in nursing education and also a factor contributing to its counterproductivity (Forehand et al. 2017:51). This is seen mainly in students with little or no exposure to the use of computer during their basic schooling.

Aim

The aim of this integrative literature review was to explore and describe technology usage for teaching and learning in nursing education.

Integrative review question

What evidence exists on technology usage for teaching and learning in nursing education?

Design and methods

This study followed an integrative literature review design to explore and describe the existing evidence on technology usage for teaching and learning in nursing education. Integrative literature review design is described as a review method that aims to summarise theoretical or empirical evidence to generate a new understanding of a specific phenomenon or a healthcare problem (Broome as quoted in Whitemore & Knafl 2005:546). As Chalmers et al. (2014:156) put it, integrative reviews are important in ensuring that new primary research is generated from the full knowledge of the existing literature. Similar to this present review, researchers intend to generate new knowledge from the existing literature on technology usage for teaching and learning in nursing education. A five-step integrative literature review framework by Whitemore and Knafl (2005:549) was used to attain the aim of this review. The steps are presented in Figure 1.

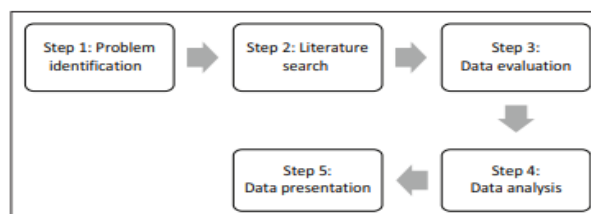
Step 1: Problem identification

Given the above background it is clear that a substantial amount of literature exists on the phenomenon in question. However, many of the studies conducted in subjects related to the use of technology in nursing education were conducted prior to COVID-19 pandemic, which necessitated the need for technology use in higher education including nursing education. Given the current impact of COVID-19 pandemic on teaching and learning in undergraduate nursing education, integrative literature review is mandatory in order to help nurse educators and researchers keep up-to-date with a large and rapidly growing body of evidence on technology use for teaching and learning in nursing education.

The purpose of this review was to explore and describe the evidence that exists on literature regarding technology usage for teaching and learning in nursing education. The variables in this review are technology usage and teaching and learning, and the population comprised articles retrieved from the initial search using the literature search strategy that is explained below.

Step 2: Literature search

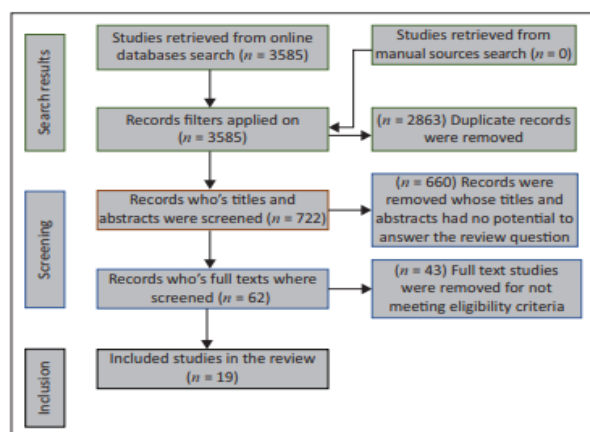
The authors searched for both empirical and non-empirical articles from EBSCOhost (health information source and health science), ScienceDirect and African journals.



Source: Adapted from Whitemore, R. & Knafl, K., 2005. 'The integrative review: Updated methodology', *Journal of Advanced Nursing* 52(5), 546–553. <https://doi.org/10.1111/j.1365-2648.2005.03621.x>

FIGURE 1: Integrative review framework.

According to Whittemore and Knafl (2005:549), online databases have proved to be effective and efficient when coming to literature search stage of integrative review. The authors purposely chose the aforementioned online databases because of their potential to answer the review question as they publish health science-related articles. In addition, literature search was conducted only on electronic databases given the current risk of COVID-19 infection from contact with objects and surfaces. A Boolean search method was used to search for literature in the aforementioned databases using the following keywords: *technology use, digital learning, online learning, nursing, and teaching and learning*. Connecting words such as 'and' and 'or' were used to search for literature. For example, literature search was conducted as "Technology use" or "Digital learning" or "Online learning". In order to enhance the literature search, synonyms such as e-learning for online learning and remote learning for digital learning were used to broaden the search of literature. The time frame was between 2016 and 2021. The rationale for including literature from 2016 was the fact that technology use has long been in the shores of nursing education. However, the authors acknowledge that the review was conducted in the COVID-19 era where technology use was at its peak. Therefore, the authors intended to explore and describe the evidence that exists on technology use in nursing education, without narrowing it to COVID-19, although acknowledging its impact on teaching-learning landscape. Specificity of literature search was ensured by the use of keywords that made the search specific to the aim of this integrative review. The use of synonyms and time frame ensured a comprehensive literature search. For each database, the authors applied filters such as 'English' and 'full texts' only to the retrieved articles in order to ensure that articles with a potential to answer the review question are subjected to screening process. An adapted PRISMA flow diagram from Stovold et al. (2014:3) was then used to further screen the studies for their relevance and potential inclusion in this



Source: Adapted from Stovold, E., Beecher, D., Foxlee, R. & Noel-Storr, A., 2014, 'Study flow diagrams in Cochrane systematic review updates: An adapted PRISMA flow diagram', *Systematic Reviews* 3(1), 1–5. <https://doi.org/10.1186/2046-4053-3-54>

FIGURE 2: PRISMA flow diagram.

present review (Figure 2). To ensure rigour, this integrative review was conducted under the supervision of experienced researchers.

Furthermore, Whittemore and Knafl (2005:549) emphasise that sampling decisions such as keywords and search terms and inclusion and exclusion criteria must be rationalised and documented. Therefore, the rationale for the inclusion and exclusion criteria is described in Figure 3.

Step 3: Data evaluation

Nineteen articles were finally selected for inclusion in this review. The authors adapted the quality appraisal criteria by Kangasniemi, Pakkanen and Korhonen (2015:1748) to appraise the quality of studies. Studies were appraised on four quality domains, namely, aims and objectives, study design, research methods and limitations. Studies were further evaluated on a three-point scale and were classed as 'yes', 'poor' or 'not reported' presented as 'Y', 'P' or 'NR', respectively (Table 1). The choice of this quality appraisal tool was based on its track record as it was used by Kangasniemi et al. (2015:1748) and later adapted by Moagi et al. (2021:4) in their study, thus making the tool valid and reliable. However, articles were not excluded based on data evaluation. Most articles that were included in this present review followed quantitative approach wherein the researchers used surveys and questionnaires for data collection. This was followed by qualitative approach with interviews as their main method of data collection. The remaining articles followed mixed methods approach.

Step 4: Data analysis

Articles were analysed independently by the authors following six steps of thematic analysis, namely, familiarisation, coding, generating themes, reviewing themes, defining and naming themes, and writing up. Firstly, the authors went through included articles before analysis. Secondly, the authors highlighted phrases of the texts which described the content of such texts. Thirdly, themes were then generated from the pattern of the codes which were identified in the literature. Fourthly, the authors checked the accuracy of the themes to ensure that they are a true representation of the included studies. Fifthly, the authors labelled each theme, and this was succeeded by the

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> Articles published in English to avoid high translation cost for studies published in other languages. Articles published between 2016 and 2021 to obtain recent data. 	<ul style="list-style-type: none"> Articles published in any language than English because they were costly to translate to English. Articles without full texts because the authors could not get the detailed findings of such studies. Conference reports because they do not follow scientific research methods and therefore could not be assessed for rigour. Articles that focused in technology usage and teaching and learning in other disciplines than nursing because they did not have a potential to reach the objective of the study.

FIGURE 3: Inclusion and exclusion criteria.

TABLE 1: Quality appraisal of articles.

No.	Author(s) year, Country	Purpose	Design	Highlights of key findings	Quality appraisal criteria (Scale: Y = yes, P = poor, NR = not reported)
1.	Barisone et al. (2019), Italy	To explore the perception and effectiveness of web-based learning in facilitating the development of clinical skills in undergraduate nursing students.	Qualitative descriptive study	Clinical learning is fundamental to prevent and know how to manage risky situations. Therefore, it is important to facilitate the learning of gestural skills and can be effectively done with the support of technology. These learning instruments, which are easy to use and access, could reinforce the knowledge development process by acting as a bridge between theory and practice.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (Y) Limitations presented.
2.	Chang and Lai (2021)	To understand the experience of nursing students in using virtual reality skill learning process.	Qualitative exploratory descriptive design	Most students expressed that because the virtual reality environment was responsive to hand touch, the gestures were easier to learn. By enabling learners who are unfamiliar with the technology to understand the comprehensive process, the system can assist in the learning process. Furthermore, the system provides learning resources on demand, thus creating an independent and stress-free learning environment.	(P) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (NR) Limitations presented.
3.	Coopasami Knight and Pete (2017), South Africa	To assess the students' readiness to make a shift from traditional learning to the technological culture of e-learning at a university in Durban.	Quasi-experimental interrupted time series	Less than half (47%) initially knew what e-learning was and this improved to 75% post-intervention. Just less than half (46%) of the participants thought that e-learning could lead to social isolation, but most DUT nursing students live in residence and enjoy an active social life. Turning to the overall e-learning readiness score, most (72%) of the participants were categorised as 'proceed with caution'.	(P) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (Y) Limitations presented.
4.	Foronda et al. (2016), United States of America	Evaluation of vSIM for Nursing: A Trial of Innovation.	Descriptive, mixed-methods design	Respondents reported that the content of the virtual simulation was directly relevant to their role as a nurse (61% strongly agree and 39% agree). Nearly, all the nursing students who participated recommended vSIM for future use, suggesting that the virtual simulation experience was a positive one.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (Y) Limitations presented.
5.	Harerimana and Mtshali (2019), South Africa	To explore nursing students' perceptions and expectations regarding the use of technology in nursing education.	Cross-sectional descriptive quantitative research	The students perceived that technology was used by educators to deliver instructions (3.77 ± 1.19), to maintain students' attention (3.77 ± 1.19) and to make connections to the learning process through audio or video material (3.64 ± 1.36). Nursing students reported that educators use technology for various academic purposes. Overall, the majority of the nursing students had high expectations for nurse educators to use Moodle (88.7%), search tools (75.3%), published electronic resources (70.7%) and early-alert systems designed to catch potential academic trouble as soon as possible (70.0%).	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (NR) Limitations presented.
6.	Maboe (2017), South Africa	To determine how the discussion forum as an online interactive tool be used in an ODL institution to enhance student-to-student and student-to-lecture online interactions.	Quantitative descriptive study	Computers and cell phones with Internet access allow students access to the discussion forum on the website of an ODL institution. Thirty-four (39.5%) of the respondents agreed that the online discussion forum allows them to study with their peers; 28 (32.5%) strongly agreed; and 17 (19.8%) were unsure. About 20.0% of the respondents indicated that they get no support from lecturers and fellow students when they interact online.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (Y) Limitations presented.
7.	Mackay et al. (2017), New Zealand	To describe the process of introducing teaching innovation and to explore clinical lecture perceptions and experience of the use of mobile smart devices to support student learning.	Qualitative descriptive study	The use of the iPad enabled a rich range of resources to be available to both the lecturer and the student. The lecturers were very positive about the immediate and portable connectivity to a rich range of resources. There were reports that it enhanced the students' critical thinking.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (NR) Limitations presented.
8.	Mawere, Mukonza and Kugara (2021), South Africa	The paper explores the experiences faced by first entering students from rural-based institutions on the use of digital learning during the coronavirus pandemic in South Africa.	Participatory action research method	One of the critical findings in this paper is that most rural institutions are not ready or rather lack capacity to cater for disadvantaged students. The other significant finding was the absence of devices to connect for digital learning.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (Y) Limitations presented.
9.	O'Connor and Andrews (2018)	To understand the perspectives of nursing students in relation to using smartphones and mobile apps to enhance learning in clinical environments.	Quantitative cross-sectional descriptive design	Of note there was an upward trend in those who used educational apps in practice. Although many students did not actively use apps to help them learn clinical settings, when asked if they would consider doing so, the majority said 'yes'. Compared to other approaches, students ranked mobile apps as the third most useful source of information for learning in practice.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (P) Research methods appropriate. (Y) Limitations presented.
10.	O'Connor and LaRue (2021), United Kingdom	To describe how health informatics is being integrated into a Bachelor of Nursing programme in the United Kingdom.	Case study	A wider evaluation of the new nursing informatics curricula and pedagogic framework is currently underway to determine its usefulness in giving nursing students the competencies they need to become skilled in digital health.	(P) Aims and objectives clearly described. (P) Study design adequately described. (Y) Research methods appropriate. (NR) Limitations presented.

Table 1 Continues on the next page →

TABLE 1 (continues...): Quality appraisal of articles.

No.	Author(s) year, Country	Purpose	Design	Highlights of key findings	Quality appraisal criteria (Scale: Y = yes, P = poor, NR = not reported)
11.	Oducado and Soriano (2021), Philippines	To examine nursing students' attitudes towards e-learning in two selected nursing schools in the Philippines.	Descriptive, cross-sectional research design	This is an expected finding during this uncertain and unprecedented time of crisis and as the educational system transition from the traditional delivery of instruction to a more flexible yet unpopular modality of teaching and learning. The nursing students may be unfamiliar with and not fully prepared for the new modality in learning.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (Y) Limitations presented.
12.	Singh et al. (2021), India	To provide preliminary data to the stakeholders regarding the feasibility and acceptability of e-learning.	Quantitative online survey	Computer and Internet usage and availability of dedicated space at home (where there are no environmental distractions) to attend online classes determine the feasibility or practicability of e-learning. Seamless Internet connectivity is of paramount importance to attend classes without interruption. Network-related issues were frequently reported by a significant percentage of students.	(P) Aims and objectives clearly described. (P) Study design adequately described. (Y) Research methods appropriate. (NR) Limitations presented.
13.	Suliman et al. (2021)	To investigate the experiences of undergraduate nursing students during their first uses of OL to increase the understanding of their encountered opportunities and challenges.	Qualitative exploratory descriptive design	A combination of the following platforms was used to facilitate the OL of the participants: E-learning (12 students), Microsoft Team (seven students), Zoom (16 students), Skype (seven students), WhatsApp (15 students), YouTube (eight students) and Facebook (11 students). Most study participants reported having poor skills in using OL technology. Half of the students reported that they had episodes of Internet failure whilst attending classes, taking quizzes or submitting assignments, which provoked feelings of helplessness and contributed to their dissatisfaction with the online experience.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (NR) Limitations presented.
14.	Toothaker (2018), Pennsylvania	To assess the millennial perceptions and attitudes of clickers on learning during traditional lecture series.	Mixed-method design	The qualitative results reflect positive perception of millennial nursing students' use of clickers. Ninety-one percent of the students agreed or strongly agreed that the use of clickers helped them to develop a better understanding of the subject matter when compared to traditional lecture-based classes. Eighty-nine per cent of the nursing students felt that the clicker question provided the professors to respond to concepts not understood in the classroom.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (NR) Limitations presented.
15.	Uprichard (2020), Manchester	To explore both the benefits of and barriers to e-learning.	Qualitative exploratory descriptive study	One of the clear benefits of using e-learning to deliver training is the flexibility of the location and time it needs to be completed. One of the main barriers to the use of e-learning is technical difficulty. Another barrier to the use of e-learning is technological illiteracy.	(P) Aims and objectives clearly described. (P) Study design adequately described. (P) Research methods appropriate. (NR) Limitations presented.
16.	Van Vuuren, Goon and Seekoe (2018), South Africa	The perceptions of nurse educators regarding the use of high fidelity simulation in nursing education.	Quantitative descriptive research design	Low and medium fidelity simulators are widely utilised in both classroom and clinical settings. The fact that most participants agreed that high fidelity simulators help to reduce errors and improve teaching shows that patient safety is also a priority.	-
17.	Verkuyl and Mastrilli (2017), Canada	Virtual Simulations in Nursing Education: A Scoping Review.	Arksey and O'Malley's scoping methodology	The participants in the review in general exhibited enthusiasm for virtual simulation as a teaching strategy in nursing. These findings are encouraging to faculty members who are exploring innovation in technology and provide support for further development and implementation of virtual simulations.	-
18.	Willemse Jooste, and Bozalek (2019), South Africa	To explore the experiences of undergraduate nursing students who participated in an authentic mobile learning enactment aimed at enhancing their learning experiences.	Qualitative contextual design	Challenges experienced with data/airtime/Wi-Fi, impaired communication because of poor network access and use of mobile devices in practice perceived as unprofessional.	(Y) Aims and objectives clearly described. (Y) Study design adequately described. (Y) Research methods appropriate. (NR) Limitations presented.
19.	Zarandona et al. (2019), Spain	To characterise the use of smartphones by nursing students and to assess their opinions about the use of such phones as a distracting factor during clinical practicum and smartphone restriction policies.	Quantitative cross-sectional descriptive study	Overall, 23.3% of participants admitted to having used their smartphone for personal reasons at least once during their practicum. Most students (98.3%) used their smartphones for accessing social networks, followed by university resources (42.3%). Other cited uses were as a tool for communication and coordination with other team members (19.4%) and for accessing apps to support patient care (13.4%).	(Y) Aims and objectives clearly described. (P) Study design adequately described. (Y) Research methods appropriate. (Y) Limitations presented.

Source: Adapted from Kangasniemi, M., Pakkanen, P. & Korhonen, A., 2015, 'Professional ethics in nursing: An integrative review', *Journal of Advanced Nursing* 71(8), 1744–1757. <https://doi.org/10.1111/jan.12619>

vSIM, virtual simulation; ODL, open distance learning; DUT, Durban University of Technology; OL, online learning.

sixth step which is writing up. An inductive approach of thematic analysis was used. This implies that the authors allowed data to generate themes as explained earlier. As six themes emerged: (1) technology use in nursing

education, (2) the manner in which technology is used in nursing education, (3) antecedents for technology use in nursing education, (4) advantages of technology use in nursing education, (5) disadvantages of technology use

in nursing education and (6) technology use in nursing education amidst COVID-19.

Ethical considerations

Ethical clearance to conduct this study was obtained from the North-West University Health Research Ethics Committee (NWU-HREC) (number: NWU-02071-20-A1). Ethical standards for conducting the research were followed in this article, even though it was a review and not conducted with human, plant or animal participants. Studies that had ethical approval were included.

Step 5: Data presentation

In this section, the authors outline and discuss the results of this integrative review.

Results

The key results of this integrative review are described in this section under the following themes: (1) technology use in nursing education, (2) the manner in which technology is used in nursing education, (3) antecedents for technology use in nursing education, (4) advantages of technology use in nursing education, (5) disadvantages of technology use in nursing education and (6) technology use in nursing education amidst COVID-19. The results of this study included surrogate terms for technology usage for teaching and learning, such as 'online learning', 'technology use in teaching and learning', 'e-learning' and 'virtual learning'.

Theme 1: Technology use in nursing education

The first theme discusses the frequency of technology use for teaching and learning in both classroom and clinical nursing education.

Information and communication literacy, information systems management and citizen digital health literacy are amongst the individual descriptors of learning that students should achieve in each of the key areas (O'Connor & LaRue 2021:3). This implies that digital literacy is amongst the critical cross-fields for every graduate. As a result, the increase in the number of people who use computerised devices such as smartphones is relatively proportional to the amount of time spent on these devices (Zarandona et al. 2019:70). For the students belonging to the millennial generation, technology devices have become the important tool for interaction (Willemse et al. 2019:72). This is no exception in nursing education wherein the use of technology devices both in the class and in clinical placements is an order of the day. The use of mobile applications (apps) in nursing education has been ranked top in comparison to peer learning and clinical placement coordinators (O'Connor & Andrews 2018:174). The authors further highlighted that an upward trend in technology use for teaching and learning continues to be noticed, especially in clinical nursing education.

Theme 2: Manner in which technology is used in nursing education

This theme discusses the manner in which technology is used for teaching and learning both in clinical and classroom settings.

Manner in which technology is used in classroom nursing education

According to Harerimana and Mtshali (2019:6), technology in nursing education is primarily used for communication of instructions to the students to enhance their creativity and critical thinking skills and also for building relationships with stakeholders in nursing education. The authors add that technology in nursing education is used to maintain student attention in the classroom and to corroborate theoretical learning through the use of audio virtual aids. Teaching and learning in classroom is achieved through the use of mediums such as Microsoft Teams, Skype and Zoom together with a range of available social media platforms. Using those mediums, teaching and learning is then facilitated either synchronously or asynchronously through the use of PowerPoint presentations, didactic lectures, video-based learning, case-based learning, prerecorded lectures, quizzes or online whiteboards (Singh et al. 2021:4). Moreover, technology in classroom nursing education can also be used to manage academic dishonesty through the use of software such as Turnitin (Harerimana & Mtshali 2019:9).

Manner in which technology is used in clinical nursing education

Technology use in clinical teaching can be split into two entities which are interlinked, namely, the clinical placement for WIL and simulation lab. Generally, there has been a notable increase in the use of technology applications for teaching and learning in clinical nursing education of late (O'Connor & Andrews 2018:174). According to O'Connor and Andrews (2018:174) and Zarandona et al. (2019:69), the most common uses of technology at the clinical placement for WIL include the use of software to access applications such as calculators, drug reference guide, disease and disorder books, and medical dictionary. This allows students to get the comfort of accessing instant references in their pocket when they need to make clinical decisions. On the same breath, there is a fraction of students who have been reported to misuse technology at the clinical facilities. In their study, Zarandona et al. (2019:69) found that about 23% of participants admitted to having used technology for their own personal gain whilst at the clinical services, whereas 98% admitted that they begin with accessing their social media prior to university resources. Consequently, some nurses at the clinical facilities for WIL perceive technology use by nursing students at the clinical services as unprofessional (Willemse et al. 2019:72).

The above perception by nurses at WIL facilities is different from that of nurse educators at institutions of higher learning or simulation lab. There seems to be an increasing interest by nurse educators and students to adopt technology use in teaching and learning in simulation lab (Foronda et al. 2016:131;

Van Vuuren et al. 2018:16). Virtual online learning platforms such as virtual reality have been incorporated into simulation lab to provide immersive learning experience for nursing students (Chang & Lai 2021:5). A study by Van Vuuren et al. (2018:15) demonstrated that the use of high-fidelity simulators contributes positively to the reduction of errors in nursing care, thus improving teaching and learning and prioritising patient safety. The use of technology in simulation lab was further reported to be user-friendly by students (Foronda et al. 2016:131). However, successful implementation of technology use in nursing education heavily relies on cooperation by all stakeholders involved, such as institutional management, willingness by educators and willingness by students (Verkuyl & Mastrilli 2017:45).

Theme 3: Antecedents for technology use in nursing education

For technology use in teaching and learning to be effective, there are several antecedents that need to be in place. In this theme, the antecedents or enablers of technology for teaching and learning are discussed.

Antecedents for technology use in classroom nursing education

As much as there are still challenges to adapt to technology use in nursing education, especially given the current COVID-19 pandemic, it remains a reality that nursing education is shifting to online rather than face-to-face platform. There are several enablers that need to be in place to achieve the goal of technology use in nursing education. Internet facilities, computer hardware and software, students and educator competence in computer and Internet usage are basic antecedents for the use of technology in teaching and learning (Singh et al. 2021:2). On the same breath, senior management and ICT department support is equally an important antecedent for technology use in nursing education (Mackay et al. 2017:03). This is supported by Coopasami et al. (2017:304) who found that psychological readiness, technological readiness and equipment readiness play a critical role as enablers of technology use in nursing education. Therefore, it can be summed up that simply owning a smartphone or a computer with access to Internet does not imply that one is ready for technology use for teaching and learning; readiness goes beyond equipment readiness as it also includes psychological and technological readiness.

Theme 4: Advantages of technology use in nursing education

There are several studies that have reported the advantages of technology usage in nursing education (Barisone et al. 2019:59; Mackay et al. 2017:3; Toothaker 2018:82). This theme explores the advantages of technology use in nursing education concurrently with its benefits.

Advantages of technology use in classroom nursing education

According to Coopasami et al. (2017:305), the use of technology in nursing education is one of the facilitators of self-directed and life-long learning, which are amongst the

critical cross-field outcomes. In addition, in a study conducted by Maboe (2017:225), about 40% of the respondents agreed that online discussion forums allowed them to study with their peers, whereas 20% of the respondents reported receiving no support from facilitators when engaged in online learning. This can be substantiated by the fact that when using technology for teaching and learning, tasks are usually completed at their own time and pace and that facilitates learner independence. As Uprichard (2020:272) and Coopasami et al. (2017:305) suggest, the one clear benefit of technology usage in teaching and learning is its flexibility of the location and time when completing tasks. This implies that teaching and learning can happen at any time when either party is at the comfortable location because it is neither time nor space bound.

Advantages of technology use in clinical nursing education

In clinical nursing education, the use of technology has risen recently at an alarming rate (O'Connor & Andrews 2018:174). The use of applications, such as virtual reality and virtual patients, is perceived to be convenient, speed up the skills learning process and create a stress-free learning environment (Chang & Lai 2021:5). However, at times, nurse educators find it hard to get relevant audio virtual materials to support learning of such clinical skills (Barisone et al. 2019:58). Thus, equipping nurses with technological skill through the use of technology in clinical nursing education can go a long way in improving the marketability of nursing. This is vital as many nursing education institutions and health establishments are slowly going green and require technological skills in their potential incumbents.

Theme 5: Disadvantages of technology usage in nursing education

This theme discusses the disadvantages of technology use in both clinical and classroom nursing education. The disadvantages are discussed concurrently with the challenges.

Disadvantages and challenges of technology use in classroom nursing education

The shift to virtual approach of teaching and learning from traditional teaching overnight amidst COVID-19 lockdown regulations came as a huge challenge for many educational institutions to adapt to such sudden change. Network-related issues which include audio virtual disparities, interruption of sessions because of unexpected logging out from network and continuous buffering are amongst the challenges experienced when using technology for teaching and learning (Singh et al. 2021:2). Moreover, poor connectivity and technological illiteracy are also the challenges related to the use of technology for teaching and learning in nursing education (Suliman et al. 2021:3; Uprichard 2020:273). In addition, participants reported lack of time management between family responsibilities and online learning amongst married couples, which was seen as a disadvantage of technology use in classroom nursing education (Suliman et al. 2021:4).

Disadvantages and challenges of technology use in clinical nursing education

As much as the use of technology in nursing education should not lose the unique potentiality of nurse–person relationship, it seems to be lacking human interaction (Uprichard 2020:273). This is seen as a disadvantage when using technology for clinical nursing education, in a sense that, in the nursing profession, nurse–patient interaction and relation is vital as it plays a role in facilitating the tridomains of competence, namely, psychomotor, affect and cognitive. As a result, some clinical staff perceive the use of technology devices negatively; it is seen more as a social than an educational tool (Mackay et al. 2017:3).

Theme 6: Technology use in nursing education amidst COVID-19

It is almost impossible to divorce technology use in nursing education with COVID-19 pandemic, especially in this era. This pandemic has indeed changed the teaching–learning landscape by navigating it to an abrupt online modality of teaching and learning, thus making technology use in nursing education unpopular and unfamiliar to nursing students because of a lack of preparation for its introduction (Oducado & Soriano 2021:8). Although the main purpose for the shift to fully use technology for teaching and learning amidst the COVID-19 pandemic was mainly to save the academic year, several researchers reported mainly on the challenges that were brought about the implementation of this modality of teaching and learning (Mawere et al. 2021:53; Oducado & Soriano 2021:8; Singh et al. 2021:6). Such challenges included (1) the lack of training for both students and educators on technology-supported teaching and learning, (2) the lack of infrastructure that enables technology-supported teaching and learning and (3) the lack of devices that are necessary for technology-supported teaching and learning. The challenges were mainly owing to its abrupt introduction and the disparities that exist between the ‘haves’ and the ‘have-nots’. As Singh et al. (2021:6) and Mawere et al. (2021:53) put it, infrastructure for technology use for teaching and learning, including lack of capacity to use technology devices, is a huge challenge facing rural education institutions and disadvantaged students. Nevertheless, the upward trend of technology use remains in the shores of nursing education.

Discussion

This integrative review offered a contemporarily updated evidence on technology usage for teaching and learning in nursing education. The findings of this integrative review indicated that there is a general adoption of technology usage for teaching and learning in higher learning institutions, although some challenges with regard to full adoption are still noted. This is evidenced by the recent upward trend in technology use for teaching and learning, especially given the current COVID-19 social distancing regulations. A study conducted by O’Connor and Andrews (2018:174) concurs with the results of this review wherein they found that there

is a notable upward trend in technology use for teaching and learning. Of the same importance is that this current review summarised evidence of the uses of technology in teaching and learning and its advantages.

The findings of this study further highlight that technology use in nursing education is not limited to classroom boundaries, but goes as far as clinical nursing education as well. Although their uses are different in those two components of nursing education, their aim is to corroborate or to complement each other. However, the acceptance of its use especially by nurses at the clinical facilities for WIL seems to be an issue till date. According to Willemse et al. (2019:72), technology use at clinical facilities is perceived to be unprofessional. Zarandona et al. (2019:69) stated that some students have been reported to be using technology devices for personal issues at least once when at practicals. However, there is no evidence supporting the connection between the negative perception of technology use by nurses and the seldom incorrect use of technology by student nurses.

Like any other approach in teaching and learning, there are disadvantages of technology use in teaching and learning. In this review, the disadvantages are discussed together with the challenges. Poor connectivity and interrupted sessions are amongst the challenges of technology use highlighted by a number of researchers (Maboe 2017:226; Suliman et al. 2021:3; Uprichard 2020:273). Similarly, connectivity which leads to interrupted sessions seems to be an issue in the geographical context of the authors of this current review. In addition, the findings of this integrative review highlighted that some institutions have no capacity to offer technology-based nursing education because of lack of resources, which led to course extension for students. However, the common factor in the articles included in this review is that they were all conducted in urban areas with university students and educators as the study population.

Limitations of the study

The researchers used ‘technology use’ and ‘nursing education’ as search terms in this study, and there are other surrogate terms to these two terms used to search for literature. As a result, there is a likelihood that if a similar study can be conducted using surrogate terms like ‘health science education for nursing education’ and ‘e-learning for technology use’, it might yield different results. Secondly, the time frame in this study was set to the recent years (2016–2021), which can be a limitation also, given the fact that technology use in general has long been a burning issue given the fast approaching of Fourth Industrial Revolution. Lastly, the researchers focused on a discipline of nursing education in which if the context could be changed, it might yield different results.

Conclusion

The results of this integrative review showed that despite the few challenges and disadvantages reported with regard to technology use, its use continues to grow in an exponential

way. Furthermore, the results showed that technology in nursing education is used in both clinical and classroom teaching to complement learning. However, there is still a gap in its acceptance despite its upward trend. To meet the demands of the Fourth Industrial Revolution and the upward trend of technology use amidst COVID-19 pandemic and possibly beyond, the authors of this study recommend that further studies should explore the acceptance of technology use by educators and students in nursing education. Also, further research is recommended on students' and educators' attitude towards technology use for teaching and learning in nursing education.

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Competing interests

The authors have declared that no competing interests exist.

Authors' contributions

All authors contributed equally to this article, from the conceptualisation until the completion of the final manuscript.

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Data availability

Data sharing is not applicable to this article because the study used data that are already in the public domain.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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2.3. Manuscript 2

2.3.1. Health SA Gesondheid journal author guidelines

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The author guidelines include information about the types of articles received for publication and preparing a manuscript for submission. Other relevant information about the journal's policies and the reviewing process can be found under the about section. The **compulsory cover letter** forms part of a submission and must be submitted together with all the required [forms](#). All forms need to be completed in English.

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An original article provides an overview of innovative research in a particular field within or related to the focus and scope of the journal, presented according to a clear and well-structured format. [See full structure of original research articles below.](#) If a submitted manuscript has been previously posted in an open access repository (e.g., a dissertation or thesis posted in an open-access university repository), the submitted manuscript must be unique and have less than 50% overlap with the posted paper.

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Ethical statement	should be included in the manuscript

A **systematic review** follows the same basic structure as an original research article:

- Structured abstract: Background, aim, setting, methods, results, conclusion, contribution.
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- Methods section: Describe in detail the search strategy, criteria used to select or reject articles, attempts made to obtain all important and relevant studies and deal with publication bias (including grey and unpublished literature), how the quality of included studies was appraised, the methodology used to extract and/or analyse data.
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Word limit	1200 words
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Commentaries draw attention to or present criticism on a previously published article, book, or report, often using the findings as a call to action or to highlight a few points of wider relevance to the field. Commentaries do not include original data and are heavily dependent on the author's perspective or anecdotal evidence from the author's personal experience to support the argument.

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- Background: Summarise the social value (importance, relevance) and scientific value (knowledge gap) that your study addresses.
- Aim: State the overall aim of the study.

- **Setting:** State the setting for the study.
- **Methods:** Clearly express the basic design of the study, and name or briefly describe the methods used without going into excessive detail.
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- **Contribution:** Concise statement of the primary contribution of your manuscript.

Do not cite references and do not use abbreviations excessively in the abstract.

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[For Qualitative Research - Measures of Trustworthiness]

Measures of Trustworthiness: This refers to the findings of the study being based on the discovery of human experience as it was experienced and observed by the participants. The following are the criteria of trustworthiness, credibility, transferability, dependability and confirmability to be discussed.

[For Quantitative Research - Reliability and Validity]

Reliability: Reliability is the extent to which an experiment, test, or any measuring procedure yields the same result with repeated trials. Without the agreement of independent observers able

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- The rigor with which the study was conducted (e.g. the study's design, the care taken to conduct measurements and decisions concerning what was and was not measured).
- The extent to which the designers of a study have taken into account alternative explanations for any causal relationships they explore.

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The acknowledgement section follows the conclusions section and addresses formal, required statements of gratitude and required disclosures. It includes listing those who contributed to the work but did not meet authorship criteria, with the corresponding description of the contribution. Acknowledge anyone who provided intellectual assistance, technical help (including with writing and editing), or special equipment and/or materials. Authors are responsible for ensuring that anyone named in the Acknowledgements agrees to be named.

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Example 6	<p>A.B. designed and performed the experiments, derived the models and analysed the data. B.C. assisted with XYZ measurements and C.D. helped carry out the XYZ simulations. A.B. and D.E. wrote the manuscript in consultation with C.D., B.C. and E.F..</p>
Example 7	<p>A.B. devised the project, the main conceptual ideas and proof outline. B.C. worked out almost all of the technical details, and performed the numerical calculations for the suggested experiment. C.D. worked out the bound for quantum mechanics, with help from D.E.. E.F. verified the numerical results of the xyz by an independent implementation. F.G. and G.H. proposed the xyz experiment in discussions with A.B.. B.C., C.D., G.H. and A.B. wrote the manuscript.</p>

Example 8	A.B., B.C. and C.D. designed the study. A.B., D.E. and E.F. performed the xyz experiments. F.G. and G.H. performed XYZ simulations. I.H. and M.C. expressed and purified all proteins. A.B., H.J., B.C. and C.D. analysed the data. A.B., B.C. and C.D. wrote the paper with input from all authors.
Example 9	A.B. and B.C. designed and directed the project; C.D., D.E., A.B. and B.C. performed the experiments; C.D. and B.C. analysed spectra; A.B. and E.F. made the simulations; B.C. developed the theoretical framework; C.D., A.B. and B.C. wrote the article.
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Data openly available in a public repository that	The data that support the findings of this study are openly available in [repository name] at [URL], reference number [reference number].

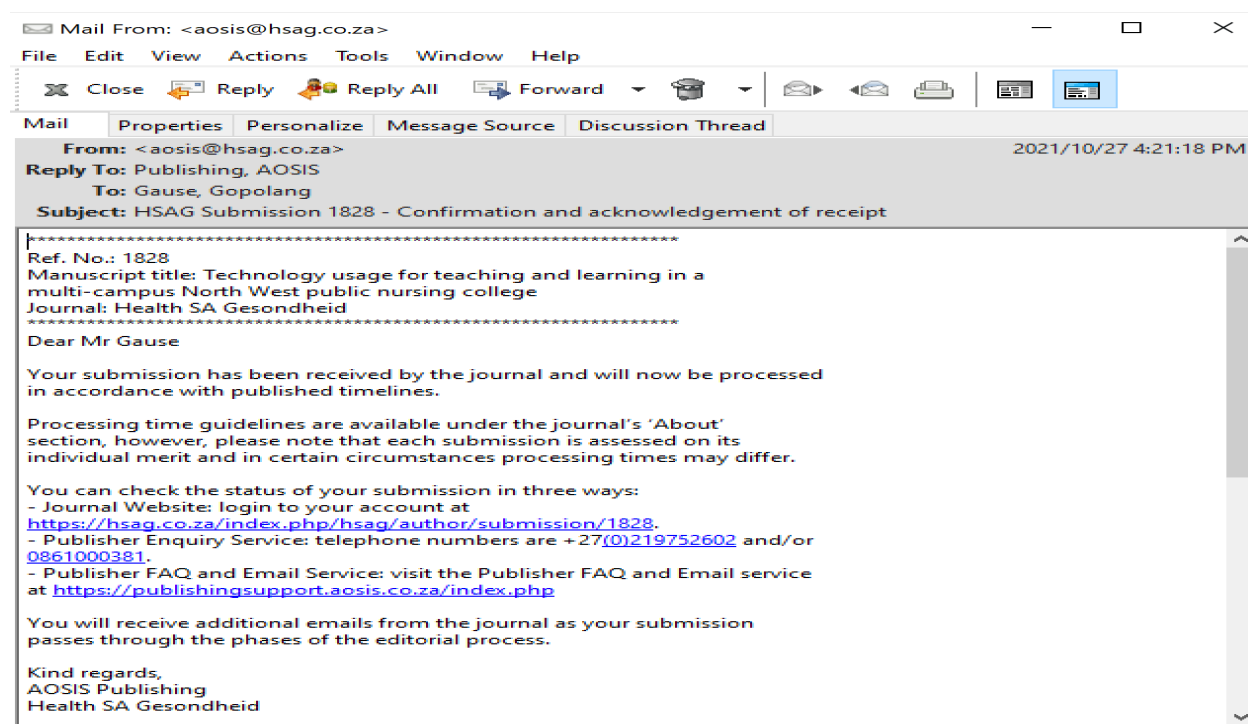
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Information technology for teaching and learning in a multi-campus public nursing college



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Background: Technologies, such as the use of information technology for teaching and learning, e-learning and virtual learning, are commonly used terms in today's education system. These ever growing and developing modes of teaching and learning have changed the landscape of higher education, in general. As a result, nursing education has equally responded positively to the use of information technology for teaching and learning.

Aim: The aim of this study was to describe and compare the readiness to use information technology for teaching and learning for both nursing students and nurse educators in the two campuses of a North West public nursing college.

Setting: The study was conducted in a multi-campus North West public nursing college in South Africa.

Methods: A quantitative approach of a comparative descriptive design was followed in this study. Descriptive statistics was analysed using the Statistical Package for the Social Sciences (SPSS) Version 27.

Results: A total of 285 (254 nursing students and 31 nurse educators) respondents completed the online questionnaires. Both nurse educators and nursing students were in agreement with the information technology use readiness construct (83.9% and 77.9%, respectively). For all the variables with significant (< 0.05) p -values from the Mann-Whitney U test, the mean ranks were higher for the Ngaka Modiri Molema District (NMMD) campus.

Conclusion: When comparing the two campuses, conclusion can be drawn that the campus at NMDD is more ready to use information technology for teaching and learning than the campus at Dr Kenneth Kauda District.

Contribution: The results of this study contribute to the body of knowledge on technology use for teaching and learning in nursing education.

Keywords: nursing; nursing education; public nursing college; teaching and learning; technology usage.

Introduction

Terminologies, such as the use of information technology for teaching and learning, digital, online learning, e-learning and virtual learning, are commonly used in today's education system. By definition, the use of information technology for teaching and learning can be described as the use of computer-based educational tools and/or systems to conduct the process of teaching and learning (Elbasuony, Gangadharan & Gaber 2018:4). This ever growing and developing model of teaching and learning has changed the landscape for higher education, in general (Yangoz 2017:231). In their study conducted in Iran, Sheikhaboumasoudi et al. (2018:219) revealed that the introduction of information technology in teaching and learning has a potential to improve the learning outcomes. As a result, nursing education has equally responded positively to the use of information technology for teaching and learning as evidenced by its introduction in countries, such as Australia, Canada, United Kingdom and America (Elbasuony et al. 2018:4). However, Hirkani and Supe (2018:77) argue that its use in the category of health professions education seems to be in its infancy stage in some parts of the world, particularly in the underdeveloped states in the African continent.

In an African context, there has been a noticeable increase in technology use and willingness to incorporate its use in almost all sectors of life in countries like Rwanda, with more emphasis placed on the education sector (Harerimana & Mtshali 2020:28). According to a study conducted by Bobtayo, Essel, and Mohammed (2020:11) in Ghana, information technology in nursing education is used for a variety of reasons ranging from academic administration to actually conducting lessons.

Furthermore, its use includes lecture preparation for both class activities and assessments (Harerimana et al. 2016:26). Nevertheless, a study conducted by Bobtayo et al. (2020:11) revealed that assessments and record-keeping remain primarily paper-based in most of the nursing and midwifery colleges. This is in line with the anecdotal evidence of the authors of this article being nurse educators and affiliated with the quality assurer body of the public nursing college where this study was conducted. Furthermore, the authors have witnessed limited use of information technology for teaching and learning, including evaluating students' competence because of issues related to academic integrity, poor connectivity, lack of devices and information technology illiteracy to mention a few.

Despite the above notion, it is inevitable that information technology use is the future of nursing education in order to satisfy the critical cross field outcomes such as lifelong and continuous learning (Pete, Coopasami & Knight 2017:303). The emphasis to the latter became more apparent amidst the coronavirus disease 2019 (COVID-19) era that continues to sweep through the world, to date. This pandemic became a game changer in almost all spheres of life and ushered new ways of working, including nursing habits, nursing practice, and the way in which teaching and learning are approached (Esterhuizen 2020:4; Makumbe 2020:621). The declaration of state of disaster by President Cyril Ramaphosa on 15 March 2020 followed by the introduction of lockdown regulation on 26 March 2020 forced many institutions of learning to adopt virtual teaching and learning modalities. Makumbe (2020:628) raised a question of whether the use of technology in teaching and learning will effectively serve or disadvantage the needy, given the economic disparities that prevail in the country where this study is conducted.

The authors have further observed a dearth of literature on studies related to the phenomenon 'technology use for teaching and learning at the public nursing colleges in South Africa'. This is despite the fact that public nursing colleges in South Africa produce between 73% and 80% of professional nurses annually (Geyer 2020:27). Although there is willingness to use technology, especially in clinical nursing education, educators feel that they need upskilling with regard to the use of information technology for teaching and learning to bring their A-game (Powell, Scrooby & Van Graan 2020:04; Van Vuuren, Goon & Seekoe 2018:15). Given the above background and the ever-growing use of information technology in nursing education because of the inevitable fourth industrial revolution and the current COVID-19 pandemic, the authors found it befitting to conduct this current study. The researcher intended to conduct this study in an attempt to close the knowledge gape that exists with regard to information technology usage for teaching and learning at the selected two campuses of the North West public nursing college. The aim of this study was to describe and compare the readiness to use information technology for teaching and learning for both nursing students and nurse educators in the two campuses of a North West public nursing college, with the following objectives:

1. To describe the readiness in information technology usage for teaching and learning by nursing students and nurse educators in the two campuses of a North West public nursing college
2. To compare the readiness in information technology usage for teaching and learning by nursing students and nurse educators in the two campuses of a North West public nursing college.

Research methods and design

Study design

A quantitative approach of a comparative descriptive design was followed in this study. A quantitative comparative descriptive design is described as a logic of comparison wherein the researcher compares two or more situations or cases which are meaningfully contrasting (Bryman & Bell 2014:114). Similarly in this study, the authors chose comparison descriptive design in order to (1) describe the readiness in information technology usage for teaching and learning by nursing students and nurse educators in the two campuses of a North West public nursing college, and (2) compare the readiness in information technology usage for teaching and learning by nursing students and nurse educators in the two campuses of a North West public nursing college.

Setting

The study was conducted in the North West province in South Africa. Respondents in the study included the nursing students and nurse educators from a North West Province Multi-campus nursing college. The college consists of two campuses, which are situated in the two districts out of the four districts of the province, namely Dr Kenneth Kaunda District (Dr KKD) and Ngaka Modiri Molema District (NMMD). The two campuses vary with the districts they cater for in terms of student admissions. Dr KKD/Klerksdorp campus predominantly caters for Dr KKD and Bojanala districts, whereas NMMD/Mahikeng campus primarily caters for NMMD and Dr Ruth Segomotsi Mompati Districts. Notably, the Klerksdorp campus is found in a semi-urban area, whilst the Mahikeng campus is in a predominantly rural area, thus leading to disparities concerning structural development and resource allocation. The college offers both pre- and post-registration nursing programmes, which include diploma in nursing and a range of post-graduate diplomas.

Population and sampling strategy

The study consisted of two sets of population, namely nurse educators and pre-South African Nursing Council (SANC) registration nursing students (level 1–4) enrolled for the academic year 2021 at North West Province Multi-campus nursing college pursuing SANC-R425 or SANC-R171 qualifications. Multi-level stratified random sampling technique was used in this study, given the geographical factors and the fact that data sets did not have common traits (Brink, Van der Walt & Van Rensburg 2018:122). The

two campuses were initially divided into two regions known as strata, which was followed by further stratifying students from each campus according to their level of studies which yielded four strata, namely first-, second-, third- and fourth-year nursing students (Table 1). A sample was obtained from each stratum by random sampling (see Table 2).

With regard to the nurse educators, the authors used a total sampling technique, where all nurse educators were included in the study because of their small number ($n = 40$). Therefore, the total population for both nurse educators and nursing students at each campus was computed as below.

Nurse educators ($n = 20$), first-year nursing students ($n = 50$), second-year nursing students ($n = 76$), third-year nursing students ($n = 150$) and fourth-year nursing students ($n = 58$), whereas at Klerksdorp campus, it was as follows: nurse educators ($n = 20$), first-year nursing students ($n = 50$), second-year nursing students ($n = 56$), third-year nursing students ($n = 95$) and fourth-year nursing students ($n = 62$). Table 3 depicts the inclusion criteria in this study.

To obtain a sample size, the Raosoft sample size calculator was used. An acceptable margin error was set at 5%, with a confidence level of 95% and response distribution at 50%. The sample size ($n = 234$) was determined from a total population of ($n = 597$) nursing students (i.e. 334 from Mahikeng campus and 263 from Klerksdorp campus). For fair representation of the population, the authors further calculated the proportion of students to be selected from each campus as follows: $(334/597) \times 100 = 55.946\%$ and $(263/597) \times 100 = 44.054\%$ for the campus at Mahikeng and Klerksdorp, respectively. This then implied that the nursing students sample size for Mahikeng was $0.55946 \times 234 = 131$ and for Klerksdorp, it was $0.44054 \times 234 = 103$. The last aspect was to determine the sample size per study level for inclusion in this current study (Table 3).

The selection of students was carried out through a fishbowl technique to obtain the sample at each study level as shown in the above table.

Data collection

A self-administered questionnaire by Mohammed (2019:6) on 'E-learning Readiness from Perspectives of Medical Students: A Case Study of University of Fallujah' was used. The questionnaire had a Cronbach alpha of 0.913 in the original study that was used, which deemed it to be valid and reliable. The data collection tool was piloted with 10% (60 nursing students and four nurse educators) for each of the population, and necessary adjustment was made to suit the context of this study.

The internal consistency specifically to this study was then measured using the Cronbach alpha value within the Statistical Package for the Social Sciences (SPSS) version 27. The amendments of the tool were then made according to the

TABLE 1: Population for both nurse educators and nursing students per campus.

Population	N
North West Public Nursing College: Mahikeng campus	
First-year level	50
Second-year level	76
Third-year level	150
Fourth-year level	58
Nurse educators	20
North West Public Nursing College: Klerksdorp campus	
First-year level	50
Second-year level	56
Third-year level	95
Fourth-year level	62
Nurse-educators	20

TABLE 2: Sample size for nursing students.

Level of study	Population	Proportion (n/N)	Sample
NMMD campus			
First year	50	$50/334 = 0.150$	$0.150 \times 131 = 20$
Second year	76	$76/334 = 0.228$	$0.228 \times 131 = 30$
Third year	150	$150/334 = 0.449$	$0.449 \times 131 = 59$
Fourth year	58	$58/334 = 0.174$	$0.174 \times 131 = 23$
Total	334	1.000	131
Dr KKD campus			
First year	50	$50/263 = 0.190$	$0.190 \times 103 = 20$
Second year	56	$56/263 = 0.213$	$0.213 \times 103 = 22$
Third year	95	$95/263 = 0.361$	$0.361 \times 103 = 37$
Fourth year	62	$62/263 = 0.236$	$0.236 \times 103 = 24$
Total	263	1.000	103

KKD, Kenneth Kaunda District; NMMD, Ngaka Modiri Molema District.

TABLE 3: Inclusion criteria and justification.

Inclusion criteria	Justification
Nurse educators	
Registered with SANC as a nurse educator. A minimum of 1 year experience as an educator.	Nurse educators are directly involved in teaching and learning To ascertain that such nurse educator understands the teaching and learning processes at the selected institution
Nursing students	
Enrolled for 2021 academic year. Pursuing SANC-R425 or SANC-R171 qualifications	To ensure that information received is current For inclusion of all levels, both SANC-R425 and SANC-R171 nursing programmes offered from North West public nursing college are included as they are running parallel because one (SANC-R425) is being phased out, whereas the other one (SANC-R171) is phasing in.

SANC, South African Nursing Council.

similarity index obtained from the Cronbach alpha report. The authors then considered the value obtained as the Cronbach alpha in this study.

Following the word of mouth recruitment process, the authors requested a permission from the gatekeepers to place the recruitment pamphlet on the notice boards at each campus during block sessions in accordance with their institutional communication policies. The recruitment pamphlet had contact details of authors and independent research assistant, for potential participants to contact the authors and share their preferred method of receiving the link to the questionnaire should they be interested to participate. The questionnaire was then shared with participants who contacted the authors through either WhatsApp or e-mail depending on their preference. The

questionnaire comprised six sections, including (1) the informed consent, (2) socio-demographic characteristics, (3) attitude towards the use of technology in teaching and learning, (4) content and culture readiness, (5) technology-use readiness and (6) participation declined.

Respondents were provided up to 14 days to familiarise with the questionnaire, which implied that responses were only obtained after 14 days from the date of sharing the link. That is, no response was received within the initial 14 days as participants were reading through the informed consent, which was in the first section of the questionnaire. Feedback was received from participants electronically through Google docs, which was linked to the authors' institutional Google drive wherein its password is only known to them, thus ensuring safe data management. Only the authors and statisticians had access to the data.

The key issue involved in data collection was the presence of COVID-19 pandemic, which restricted human interaction and affected the return rate of the questionnaires. In addition, lack of technology skills and devices were key issues as some participants found it either difficult to fill in an online questionnaire or did not fill it in at all. Some questions were returned empty or incomplete because of the aforementioned key issues.

Data analysis

Descriptive statistics were analysed using the SPSS V27 software. Incomplete questionnaires were not analysed. A descriptive statistical test was used to determine the level of readiness in information technology use by nursing students and nurse educators in the two campuses of a North West public nursing college. Furthermore, the authors ran the Mann-Whitney *U* statistical tests to compare the readiness in technology usage for teaching and learning in the two campuses of a North West public nursing college. For each construct, the Cronbach alpha value was used to ascertain the reliability of the construct (internal consistency).

Validity and reliability of the data collection tool

This study adapted a data collection tool that was developed by Mohammed (2019:6) on 'E-learning Readiness from Perspectives of Medical Students: A Case Study of University of Fallujah', which had a Cronbach alpha of 0.913 and is deemed valid. However, the authors did not rely on the aforementioned Cronbach alpha value because the tool was adapted to suit the current study context. In order to ensure the validity and reliability of the adapted self-administered questionnaire referred to above, the authors conducted a pilot study with a fraction (10%) of the sample size to test if the data collection tool is testing what it is supposed to test, and to check how the units of analysis interpret the questionnaire in the context of this study. Validity and reliability of the data collection tool were ensured by running the Cronbach alpha reliability test. According to Ardian et al.

(2018:1515), Cronbach alpha values of 0.6 or greater imply that the reliability of the construct is acceptable. Higher values are even better. The authors adopted this interpretation of the Cronbach alpha value in the current study. As a result, the constructs were reliable, except for content readiness for educators which had a Cronbach alpha value of 0.528. Where the reliability was unacceptable, the items with negative item-correlations were removed to improve the reliability of the construct. According to Tomás-Sábado, Gómez-Benito and Limonero (2005:794), items with negatively corrected item-total correlations jeopardise the reliability of the construct.

Ethical considerations

An ethical approval (NWU-02071-20-A1) was obtained from both North-West University Health Research Ethics Committee (NWU-HREC) and Provincial Department of Health research, monitoring and evaluation directorate. Subsequent to attaining approval, permission was further sought from individual campus heads who were the gatekeepers at the campuses. Participation of both sets of respondents was voluntary, and the respondents were allowed to withdraw should the need arise. Confidentiality and privacy of information were ensured according to the NWU institutional policy, and are kept for the next five years.

The study used a questionnaire as a data collection tool. According to Brink et al. (2018:139), one of the advantages of using questionnaire is that it ensures anonymity of participants; hence, it contributed in ensuring anonymity of participants. Participants were not required to give out any identifying information in the questionnaire like their names to further ensure anonymity. Both the mediator and the research assistant were required to sign a standard NWU confidentiality form that was binding them to uphold confidentiality at all costs.

Electronic informed consent was obtained voluntarily from the participants without coercion, undue influence or inappropriate incentives. The detailed electronic informed consent was attached to the questionnaire as the initial section and had the 'do you want to participate in the study' question. The answer to that question, either 'yes' or 'no' determined participation to the study. A link to the informed consent that was part of the questionnaire was shared either through WhatsApp or email depending on participants' preference. In order to ensure an informed consent, potential participants were allowed a maximum of 14 days to peruse through the electronic consent form prior to accepting or declining it.

Results

The authors adapted a self-administered questionnaire in this study which was used in a case study in the University of Fallujah to assess e-learning readiness by Mohammed (2019:6). The data collection tool used constructs as presented below to describe e-learning readiness in the context of their

study. Similar to this study, information technology usage readiness was described and compared using the following constructs as adapted from Mohammed (2019:6): (1) nurse educators and nursing students' attitude towards the use of information technology in teaching and learning by educators, (2) nurse educators and nursing students' content and culture readiness regarding information technology use for teaching and learning and c) nurse educators and nursing students' access to resources and technical skills.

The results are summarised according to the aforementioned socio-demographic and construct descriptions. That is, the authors described the results according to the constructs as the constructs formed sections of the questionnaire that was shared with the participants. Each of the three main constructs in this section was divided into two sub-constructs. The authors firstly describe the summary of the two sub-constructs for each construct for nurse educators followed by the results of nursing students.

Socio-demographic description

A total of 285 (254 nursing students and 31 nurse educators) respondents completed the questionnaires. For both sets of population, the majority were female respondents ($n = 228$), whereas a minority ($n = 57$) comprised males. About 55.4% of respondents were from NMMD campus which is predominantly rural, and only 42.8% of respondents were from Dr KKD campus which is semi-urban. The majority of respondents were third- (28%) and second- (25%) year nursing students, whereas fourth- and first-year students accounted for a minority (20% and 17%, respectively). Age distribution at first computer use was as follows: below 10 years (8.5%), between 10 and 16 years (17%) and above 16 years (74.4%).

Description of the constructs

In this section, the authors describe the results by describing the results from the sub-constructs for the two independent populations in this study. The description of the results is separated according to the populations and further presented in pie charts.

Construct 1.1: Nurse educators' attitude towards the use of information technology in teaching and learning

Attitude towards the use of technology in teaching and learning by nurse educators was assessed by the two sub-constructs, namely (1) attitude towards technology use and (2) technology use readiness. The results are presented below in the clustered bar graph (Figure 1). The pie chart shows that without considering the neutral option, the majority (71%) of nurse educators were in agreement (agree to strongly agree) with the construct 'attitude towards the use of information technology in teaching and learning' and a minority (3.2%) of nurse educators were in disagreement (disagree to strongly disagree).

Similar results were also observed for nurse educators' 'technology use readiness' sub-construct (Figure 2). The

majority (83.9%) of nurse educators were in agreement (agree to strongly agree) with the information technology use readiness construct, while a minority (3.2%) of nurse educators were in disagreement (strongly disagree).

Construct 1.2: Nursing students' attitude towards the use of technology in teaching and learning by students and educators

The majority (57.4%) of nursing students were in agreement with the sub-construct that described their 'attitude towards the use of technology in teaching and learning', whereas a minority (6.1%) of them were in disagreement, see Figure 3.

The nursing students' results (77.9%) further showed a general agreement (agree to strongly agree) to information technology use readiness sub-construct, while those in disagreement were a minority (4.8%). The results of this sub-construct are summarised in Figure 4.

Construct 2.1: Nurse educators' content and culture readiness regarding the use of information technology for teaching and learning

The results of this study revealed that the majority (45.1%) of nurse educators are in disagreement with the content readiness regarding the use of information technology for

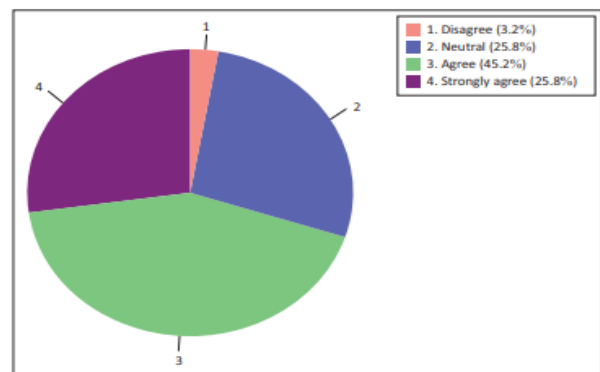


FIGURE 1: Nurse educators' attitude towards the use of technology in teaching and learning.

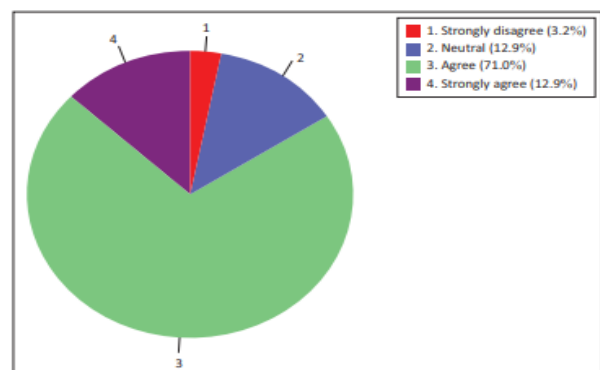


FIGURE 2: Nurse educators' technology use readiness.

teaching and learning sub-construct (Figure 5). A minority (6.5%) of respondents were in agreement. Notably, nearly half (48.4%) of the respondents neither agreed nor disagreed with the nurse educators' content and culture readiness sub-construct.

The different results were observed for culture readiness sub-construct as depicted in Figure 6. The majority (58.1%) of nurse educators were in agreement (agree to strongly agree) with the items that described their culture readiness to use information technology for teaching and learning, whereas a minority (3.2%) of them were in disagreement (strongly disagree). A relatively high percentage (38.7%) of nurse educators were also neither in agreement nor in disagreement.

More than half (50.4%) of the nursing students were in disagreement (disagree to strongly disagree) with the content readiness regarding information technology use for teaching and learning sub-construct. Only a few (13.4%) respondents were in disagreement (agree to strongly agree), see Figure 7.

Different results were observed with regard to culture readiness to use information technology for teaching and learning sub-construct (Figure 8). About 68.6% of respondents were in

agreement (agree to strongly agree) with the culture readiness sub-construct, whereas a minority (8.9%) of the respondents were in disagreement (disagree to strongly disagree).

Construct 3.1: Nurse educators' access to resources and technical skills

This construct aimed at assessing information technology use readiness of nurse educators by assessing their access to resources and technical skills (Figure 9 and Figure 10). The results showed that the majority (67.7%) of nurse educators were in disagreement (disagree to strongly disagree) with the sub-construct 'access to resources' that can enable them to

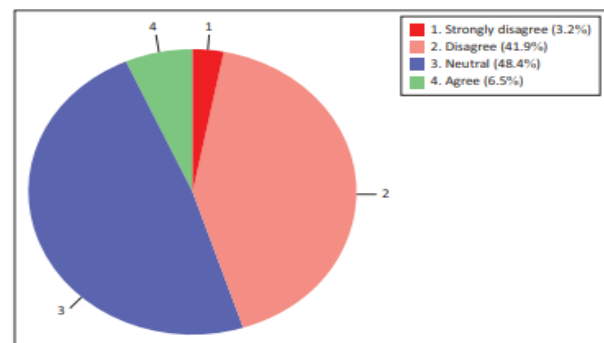


FIGURE 5: Nurse educators' content readiness.

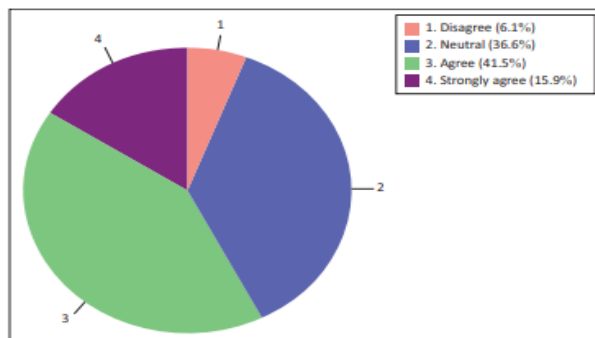


FIGURE 3: Nursing students' attitude towards the use of technology in teaching and learning.

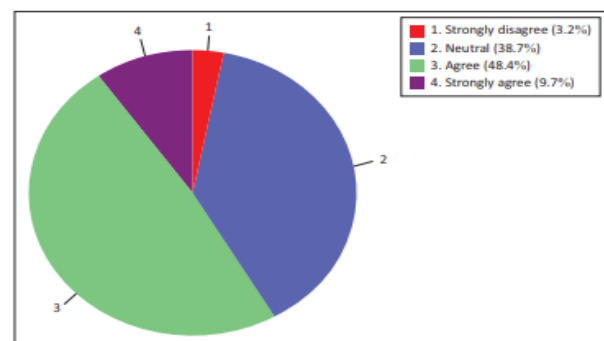


FIGURE 6: Nurse educators' culture readiness.

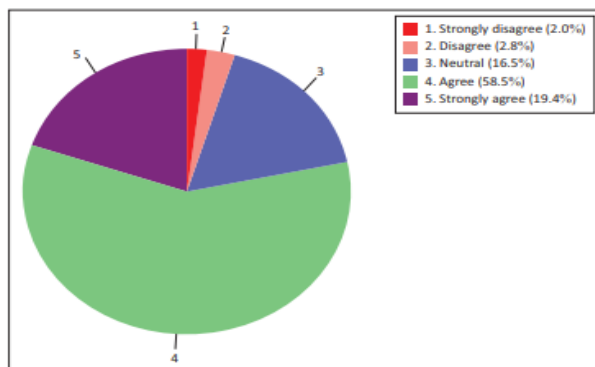


FIGURE 4: Nursing students' technology use readiness.

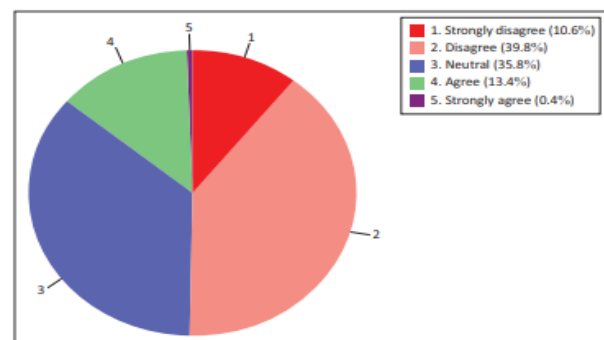


FIGURE 7: Nursing students' content readiness.

use information technology for teaching and learning. A minority (9.7%) were in agreement (agree to strongly agree).

The nurse educators' results on the sub-construct 'technical skills' showed that the majority (64.5%) of respondents were in agreement (agree to strongly agree) with the sub-construct that described the technical skills they possessed to enable them to use information technology for teaching and learning. A minority (3.2%) of respondents were in disagreement (disagree to strongly disagree) with the items in this sub-construct.

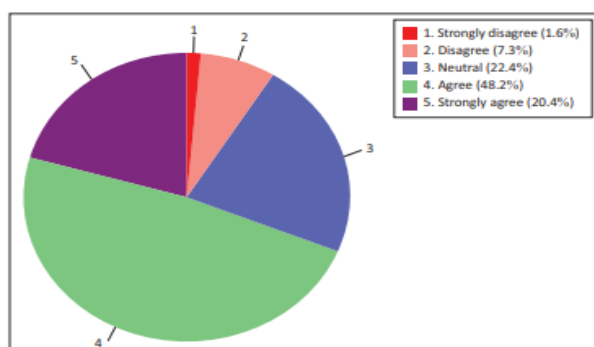


FIGURE 8: Nursing students' culture readiness.

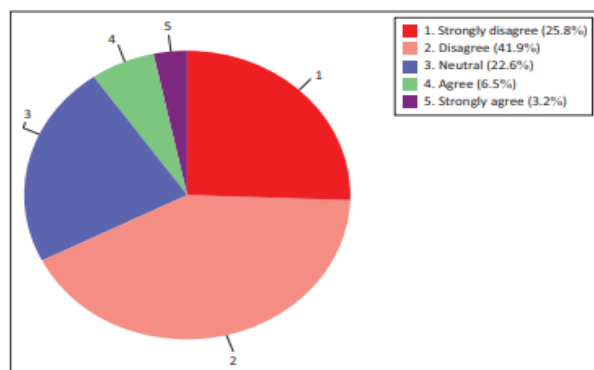


FIGURE 9: Nurse educators' access to resources.

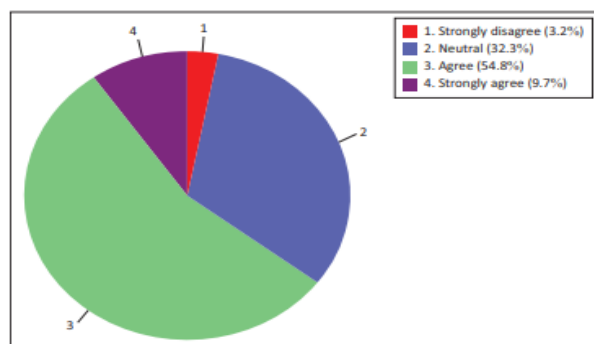


FIGURE 10: Nurse educators' technical skills.

Construct 3.2: Nursing students' access to resources and technical skills

The results of this study revealed that without considering the neutral option, the majority (48.8%) of nursing students were in disagreement (disagree to strongly agree) with the sub-construct 'access to resources' needed to use information technology for teaching and learning. A minority (13.8%) of respondents were in agreement (agree to strongly agree) with the sub-construct of nursing students access to resources (see Figure 11).

The difference was observed with the sub-construct that described the nursing students' technical skills (Figure 12). The majority (52%) of the respondents were in agreement (agree to strongly agree), whereas a minority (11%) of the respondents were in disagreement (disagree to strongly disagree).

Comparison of readiness in information technology usage for teaching and learning in the two campuses of a North West public nursing college

The authors did not run the comparative statistics for nurse educators because of their small sample size. As a result, there was no report on the comparison of readiness in information technology usage for teaching and learning for nurse educators. The authors acknowledge that the aforementioned

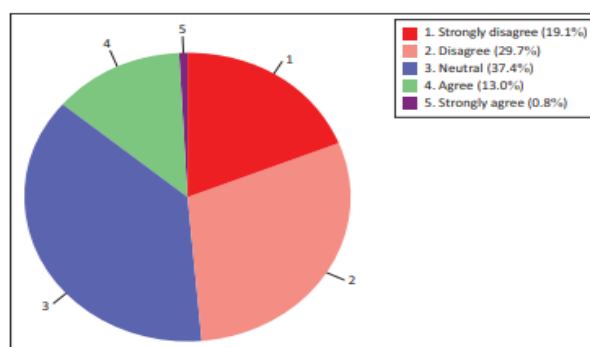


FIGURE 11: Nursing students' access to resources.

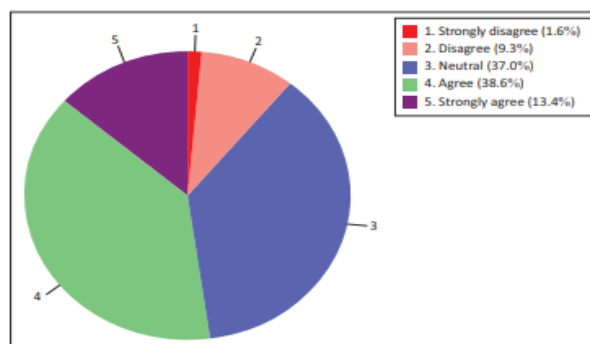


FIGURE 12: Nursing students' technical skills.

was a limitation to the study. Comparative statistics for nursing students on both campuses were run on the following variables: (1) attitude towards information technology usage in teaching and learning, (2) attitude towards information technology usage readiness, (3) content readiness, (4) culture readiness, (5) access to resources and (6) technical skills.

The results of this study revealed that the students' attitude towards information technology usage in teaching and learning, attitude towards the use of information technology readiness, culture readiness, access to resources and technical skills differ significantly across campuses because the *p*-values for the Mann-Whitney *U* test for these variables are significant at 5% level of significance. However, students' content readiness does not differ across the campuses because the *p*-values for the Mann-Whitney *U* test for these variables are insignificant at 5% level of significance (Table 3).

Table 4 further explains the difference of the Mann-Whitney *U* test observed in Table 3.

Discussion

The aim of this study was to describe and compare the readiness in information technology usage for teaching and learning for both nursing students and nurse educators in the two campuses of a North West public nursing college. The discussion of the results will be according to the set of objectives.

The level of readiness in information technology usage by students and educators in a selected public nursing college

The results of this study revealed that both educators and students are not yet ready to use information technology for teaching and learning. Nurse educators reported not being content ready and not having access to resources that can enable them to use information technology for teaching and learning. Content readiness and access to resources are key prerequisites for the use of information technology for teaching and learning. Lack thereof can be regarded as hindrances for optimum use of information technology for teaching and learning. Similar results were reported by Harerimana et al. (2016:88) in their study in Rwanda, wherein they highlighted the lack of information technology resources as a challenge facing optimum use of technology at nursing education institutions. This was despite their results having showed a generally positive attitude towards the use of information technology for teaching and learning. Pete et al. (2017:302) describe the prerequisites for the use of technology in teaching and learning as (1) psychological readiness, (2) technological readiness and (3) equipment readiness. In this study, nurse educators proved to be psychologically ready because of their positive attitude; however, technological readiness and equipment readiness were lacking.

A similar trend was observed with nursing students in this study. Nursing students showed a positive attitude

TABLE 4: Comparative statistics for campuses.

Variables	Test statistics	
	Mann-Whitney <i>U</i>	<i>p</i>
Attitude towards the use of information technology in teaching and learning	90.000	0.205
Attitude towards the use of information technology readiness	99.500	0.311
Content readiness	105.000	0.511
Culture readiness	96.000	0.297
Access to resources	107.500	0.602
Technical skills	95.500	0.279

Grouping variable: Campus.

regarding the use of information technology for teaching and learning. This implies that nursing students are psychologically ready to adopt information technology in teaching and learning. Despite the psychological readiness, there is still a challenge with regard to content readiness. There was a disagreement in the construct of content readiness which inferred that nursing students are not content ready to adopt information technology as a teaching and learning strategy. Equally important was the finding that showed that access to resources still remains a hindrance for the use of information technology for teaching and learning. These findings are supported by a study conducted by Nsouli and Vlachopoulos (2021:14), wherein they established that lack of technology infrastructure and lack of technology apparatus were some of the challenges facing the optimum use of technology for teaching and learning in their context. According to Lee, Yeung and Ip (2017:105) desire for learning which can be translated to positive attitude was found to be associated with computer use for teaching and learning. However, according to Singh (2020:26), online pedagogy is dependent on faculties and students' readiness, the attitude and skills, and knowledge to use technology for teaching and learning. Therefore, it can be concluded that both students and nurse educators at a North West public nursing college are not ready to use technology for teaching and learning.

Comparison of readiness in technology usage for teaching and learning in the two campuses of a North West public nursing college

The authors used the Mann-Whitney *U* test to compare the readiness in information technology usage for teaching and learning in the two campuses of a North West public nursing college. The Mann-Whitney *U* test is used to compare differences between two independent groups when the dependent variable is either ordinal or continuous but not normally distributed. In this study, the variables are assumed to be ordinal because their categories are ordered from strongly disagree to strongly agree. For all the variables with significant *p*-values (< 0.05) from the Mann-Whitney *U* test, the mean ranks are higher for the NMMD campus as displayed in Table 5. As the higher values (4 and 5) represent agree and strongly agree, higher mean ranks imply that most of the students from the NMMD campus were more in agreement (agree to strongly agree) with the sentiments in

TABLE 5: Ranks per campus.

Variables	Campus	N	Mean rank	Sum of ranks
Attitude towards information technology usage in teaching and learning	Dr KKD Campus	103	112.17	11554.00
	NMMD Campus	141	130.04	18336.00
	Total	244	-	-
Attitude towards the use of information technology readiness	Dr KKD Campus	104	110.16	11457.00
	NMMD Campus	141	132.47	18678.00
	Total	245	-	-
Content readiness	Dr KKD Campus	103	117.37	12089.00
	NMMD Campus	141	126.25	17801.00
	Total	244	-	-
Culture readiness	Dr KKD Campus	103	111.70	11505.00
	NMMD Campus	140	129.58	18141.00
	Total	243	-	-
Access to resources	Dr KKD Campus	104	134.46	13983.50
	NMMD Campus	140	113.62	15906.50
	Total	244	-	-
Technical skills	Dr KKD Campus	104	107.43	11173.00
	NMMD Campus	140	133.69	18717.00
	Total	244	-	-

KKD, Kenneth Kaunda District; NMMD, Ngaka Modiri Molema District.

the questionnaire than those from the Dr KKD Campus. As a result, the comparative statistics showed that the NMMD campus is more ready to use technology for teaching and learning than the Dr KKD campus.

Conclusion

The results of this study show that there are gaps as far as readiness in information technology usage for teaching and learning is concerned at the selected public nursing college's two campuses. Although many respondents (71% and 57.4% for nurse educators and nursing students, respectively) reported a positive attitude to adopt information technology for teaching and learning, much still needs to be done in terms of skill and resource empowerment. As a result, it can be concluded that the North West public college campuses are not ready to use information technology for teaching and learning. However, when comparing the two campuses, conclusion can be drawn that the campus at NMDD, apart from the aforementioned hindrances, is more ready to use technology for teaching and learning than the campus at Dr KKD.

Recommendations

The authors recommend further research on information technology usage for teaching and learning at public nursing colleges. Furthermore, the authors recommend that further research on attitudes of male nursing students towards the nursing profession needs to be conducted because of their low turnover in this study as it became apparent in the demographics, wherein the majority ($n = 228$) of them were female students, whereas male students accounted for a minority ($n = 57$). In conclusion, it is recommended that the North West department of health capacitates both nurse educators and students at public nursing colleges with the necessary technological skills and equipment needed for use in teaching and learning. These recommendations to upskill

students and their educators are made based on the results of this study; the status quo as a result of COVID-19, the fast approaching fourth industrial revolution and the technologically inclined generations that are currently admitted at institutions of higher learning.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

G.G, I.O. and M.A. contributed equally from conceptualisation until the completion of the final manuscript.

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Data availability

The data supporting the findings in this study are available from the corresponding author and can only be requested upon a valid and reasonable request.

Disclaimer

The views and opinions expressed and submitted in this article are those of the authors and they do not intend to communicate the official position of the institution of affiliation of the authors regarding the phenomenon discussed in this article.

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1.4. Summary of section 2

The above section discussed the findings of this study by means of manuscripts. The first manuscript was prepared using *Curationis* author guidelines whereas the second manuscript was prepared using *Health SA Gesondheid* author guidelines. Both guidelines are attached, and for each manuscript, the researcher attached the proof of publication to indicate that manuscripts are already published at the selected journals.

Section 3: Conclusions, Limitations, and recommendations

3.1. Introduction

The previous two sections discussed overview of the study, and the two manuscripts on integrative review and empirical study. For integrative review manuscript on **Technology usage for teaching and learning in nursing education: An integrative review**, *Curationis* author guidelines were followed. For empirical study manuscript titled **Technology usage for teaching and learning in a multi-campus North West public nursing college**, *Health SA Gesondheid* author guidelines were followed. The two manuscripts formed part of section two on this dissertation. Both integrative review and empirical manuscripts are published by the respective journals. Therefore, this section will be discussing the conclusion, limitations and recommendations for the whole study which are derived from both sections.

3.2. Conclusion

The conclusion of this study will be discussed guided by the main objectives of the study as set out in section 1.

Conclusion on current information that exist in literature on readiness of technology usage for teaching and learning in health science education.

The researcher conducted an integrative literature review on literature that exists on readiness of technology usage for teaching and learning in health science education. Seventeen articles were retrieved from several online databases and included for review. The selection of articles was done based on the inclusion and exclusion criteria as outlined in the study and depicted in the PRISMA flow diagram in the integrative review article. From the seventeen articles, none of the articles were conducted in the North West public nursing college which indicated the gap of literature in the context of this study. The conclusion drawn from this study is that technology use in general, is among the critical cross fields for every graduate including nurse graduates. Technology in nursing education is used both in classroom teaching and learning and at the clinical settings. In classroom nursing education, technology is used for communicating instructions to nursing students and to unleash their creativity through critical thinking. On the other hand, technology in clinical settings is mainly used as a quick reference for clinical diagnosis, and pharmacological and non-pharmacological management of clinical conditions. Although literature indicated many positives and benefits of technology use in health sciences education. The abrupt total shift from traditional to virtual modality of teaching and learning amid COVID-19 exposed many nursing education institutions on their preparedness to conduct

teaching and learning virtually. To add, network related issues such as poor connectivity, technology illiteracy and interruption of sessions were also some challenges that were reported from literature. It can be concluded that technology use in health sciences education is rising given the aforementioned reasons and also the current generation of students who are being admitted at higher education institutions who are technologically inclined. However, there is still so much that needs to be done to capacitate institutions of higher learning and other stakeholders in health sciences education to be able to use technology for teaching and learning.

Conclusion on the level of readiness in technology usage by students and educators in a North West public nursing college.

The researcher used the following constructs to describe the readiness in information technology usage by nursing students in a North West public nursing college: Nursing students' attitude towards the use of information technology in teaching and learning, nursing students' technology use readiness, nursing students' content readiness, nursing students' culture readiness, nursing students' access to resources, and nursing students' technical skills. For all the constructs, the researcher ran descriptive statistics to describe the readiness in information technology usage by students in a North West public nursing college. The descriptive statistics indicated a positive response in all the constructs except content readiness and access to resources. This means that the nursing students are not content ready and lack access to resources that are needed to use information technology for teaching and learning. This is despite the fact that readiness in information technology usage for teaching and learning is a trio of psychological readiness, equipment readiness, and technology use readiness. It is therefore concluded that, based on the results of this study, nursing students at North West public nursing college campuses are psychologically ready and possess the necessary technical skills needed to use information technology for teaching and learning. However, based on the fact that there is still lack of access to resources needed for information technology for teaching and learning, the researcher concludes that nursing students at a multi-campus North West public nursing college are not ready to use information technology for teaching and learning. The results of this study further indicated that nurse educators were also not ready to use technology for teaching and learning. This is not surprising to note as the major shift to online learning amid COVID-19, though it was eminent, was rather too abrupt. Therefore, the researcher concludes that a multi-campus North West public nursing college is not ready to use technology for teaching and learning.

Conclusion on comparison of readiness in technology usage for teaching and learning in the two campuses of a North West nursing college.

The researcher aimed at comparing the readiness in information technology usage for teaching and learning in the two campuses of a North West public nursing college using Mann-Whitney U test. The interest in comparison was brought about the disparities in the geographical areas of the two campuses, and the population they serve who are from predominantly rural districts of the province and the semi-urban districts of the province. NMMD campus is located in a predominantly rural area and serves rural districts of the province whereas Dr KKD is situated in a semi-urban location and caters for the two semi-urban districts of the province. Based on the aforementioned reasons and those outlined in the second manuscript, the following conclusion were made: Variables with a significant p-values (<0.05) were higher for the campus at NMMD when compared to the values at Dr KKD. Based on the fact that higher values (4 and 5) of the mean ranks represent 'agree and strongly agree', this implies that, most of the nursing students at NMMD campus were more in agreement to the constructs that described their readiness to use information technology for teaching and learning when compared to Dr KKD campus. Therefore, the evidence in this study revealed that the nursing students at NMMD campus are likely to use information technology for teaching and learning when compared to the nursing students at Dr KKD campus. Therefore, it can be concluded that, even though North West public nursing college is not ready to use technology for teaching and learning, the nursing students at NMMD campus are likely to use technology for teaching and learning when compared to their counterpart at Dr KKD campus. This is despite the Dr KKD campus located at a semi-urban area whereas the NMMD campus located at a predominantly rural area. It is important to note that the researcher did not compare the population of nurse educators from both campuses due to their small number. Therefore, the conclusion on comparison was made on nursing students only.

3.3. Limitations

The major limitation of this study is that the study was conducted amid the COVID-19 pandemic wherein it affected the response rate. Although the data collection was entirely online as previously communicated, the researcher believes that more participants could have responded if there was an option of hardcopy questionnaires. For some participants who showed much interest to participate in the study, issues of lack of device and connectivity prevented such participants from successfully completing the online questionnaire. To add, some participants were not technologically trained and struggled to open the link to the questionnaire as they were doing it for the first time. Some gave up on the process. The other limitation was that the study was conducted in North West province, thus countrywide generalisation of results might not be accurate. Thus, the recommendations should be followed with precautions as the study was based in the context of North West. Lastly, the researcher would also wish to report the

methodology use in this study as one of the limitations. This study compared the readiness in technology use for teaching and learning quantitatively. However, a mixed methods study would have been more comprehensive as the quantitative and qualitative data would complement or oppose each other.

3.4. Recommendations

The recommendations for this study were made based on the findings. Recommendations are made on nursing education and practice, policy makers, and further research. These recommendations are described below

Nursing education and practice

The researcher recommends that the public nursing colleges should keep up with the contemporary trends in the landscape of nursing education including the use of information technology for teaching and learning. There should be periodic induction of nursing students and nurse educators with the use of technology and technology devices for teaching and learning. It is recommended that the new curriculum of nursing should at least have basic technology use module taught at lower levels for nursing students to up skill them to meet the demands of the higher education fraternity and as a transition from basic education. Furthermore, it is recommended that the heads of the campuses of a North West college must engage the relevant departments, now Department of Health, to kick start the erection of necessary facilities for the use of information technology for teaching and learning at those campuses. Lastly, the researcher recommends that, registered nurses at the clinical facilities and nurse educators should also be capacitated to acknowledge and allow the use of portable digital assistants by students for learnings purposes, especially at the clinical learning environments.

Policy makers

It is recommended that the three stakeholders being: North West public nursing college, North West Department of Health, and the South African Higher Education works collaboratively in ensuring the availability of effective policies on technology use for teaching and learning at the public nursing colleges in general. The collaborative partnership should also include the partnership with officials responsible for recruitment to ensure that personnel is availed to support technology use in nursing education at public nursing colleges. Such personnel should include ICT practitioners and qualified educators to teach basic information technology use as an ancillary subject at the entry level of nursing programs at the public nursing colleges. Lastly, the researcher also recommends the drafting and implementation of effective policies that will allow the use of

information technology devices for learning purposes at the clinical environments as they have proved to be of great assistance to nursing students.

Further research

Further research is recommended for future researchers to collect data on the similar topic qualitatively or using mixed methods, as the present study was conducted quantitatively. This would either complement the results of this current study or oppose them. Furthermore, it is also recommended that further research can be done collecting data from other participants like support staff as they also influence the use of technology for teaching and learning.

3.5. Summary of section 3

In this section, the overall study conclusion, limitations, and recommendations of the study were outlined. Conclusion for the entire study was made based on the findings as presented in section two in the manuscripts. Following conclusions, recommendations for the entire study based on nursing education and practice, policy making, and further research were made.

ANNEXURE A: DATA COLLECTION TOOL

Topic: Readiness in technology usage by students and educators in a North West public nursing college.

INSTRUCTIONS

1. Your contribution to learning and teaching of nursing students is much valued.
2. Please be kind to complete this questionnaire which is part of my research dissertation.
3. Please answer the questions to the best of your ability.
4. Kindly be as objective as possible.
5. Do not write your name to ensure confidentiality and anonymity.
6. The completion of the questionnaire is not compulsory, but your assistance is appreciated.

Section 1: Socio demographic characteristics of respondents from NW public nursing colleges

Sex : Male Female

NW public nursing college campus : Dr KKD NMMD

Designation : Student Educator

If student, level of study: 1st year 2nd year 3rd year fourth year

Age distribution: 18 – 20 years 21 -24 years 25 and above

Age at first computer use: Below 10 years 10-16 years above 16 years

Section B: Attitude toward the use of technology in teaching and learning by students and educators

Attitude toward the use of technology in teaching and learning	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am not in favour of full time use of technology in teaching and learning as it lacks the Face-to-face interaction between students and educators					
I am not in favour of the use of technology in teaching and learning because it leads to social isolation					
I am not in favour of the use of technology in teaching and learning because it is a complex process for students with beginner-level computer skills					
I am in favour of the use of technology in teaching and learning and ready to accept it					
The use of technology readiness					

I am personally commitment to the use of technology in teaching and learning					
I am experienced with technology-based training					
I am willing to collaborate and share information and knowledge through technology teaching and learning platforms					
I am ready to move beyond a predominant reliance on classroom training to the use of technology in teaching and learning approach					
I need more training for the use of technology in teaching and learning content development					

Section C: Content and culture readiness among educators and students

Content readiness	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
There are available teaching materials that can enable the use of technology in teaching and learning					
I have attended the use of technology in teaching and learning training at the institution					
I have the required basic computer skills for the use of technology in teaching and learning					
There is reliable information technology infrastructure that can support the use of technology in teaching and learning at the college					
Culture readiness					
I find it easy to use technology tools for teaching and learning					
Interaction with technology tools for teaching and learning is clear and understandable					
The use of technology in teaching and learning system is flexible to interact with					
The use of technology in teaching and learning motivates my teaching or learning					
The use of technology can improve quality of teaching and learning					
The use of technology in teaching and learning can increase productivity					
Adopting the use of technology can increase students' satisfaction					
The use of technology in teaching and learning enables learning more					

effectively than the traditional classroom based approach					
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Section D: Technology readiness among educators and students

Access to resources	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I cannot afford to buy a computer or most information and communication technology devices					
I have access to a dependable computer/laptop					
There is available of information technology infrastructure in school					
My institution has a web site					
There are available professionals in the institution to carry out the use of technology in teaching and learning training programs					
I cannot spare the time required to attend the use of technology in teaching and learning training programs at the college					
Technical skills					
I have knowledge of the basic functions of computer hardware components and its peripherals					
I have Microsoft office suite installed in personal computer and its used confidently					
I use internet as information source					
I have an email address and can use it					
I can use web browser confidently					
I know how to use online library and other resource database					
I know how to use asynchronous tools (e.g., discussion boards, chat tools) effectively					

Thanks for your participation.

Gopolang Gause (researcher)

ANNEXURE B: INFORMED CONSENT



INFORMED CONSENT DOCUMENTATION FOR NURSE EDUCATORS AND NURSING STUDENTS AT NORTH WEST PUBLIC NURSING COLLEGE

TITLE OF THE RESEARCH STUDY: Readiness in technology usage by students and educators in a North West public nursing college

ETHICS REFERENCE NUMBERS: NWU-02071-20-A1

PRINCIPAL INVESTIGATOR: Mr IO Mokgaola & Prof MA Rakhudu

POST GRADUATE STUDENT: Mr Gopolang Gause

ADDRESS: Office G12, Building A13, NWU-Mahikeng campus

CONTACT NUMBER: 0717835305

You are being invited to take part in a research study conducted by G Gause, about the readiness in technology usage by students and educators in a North West public nursing college.

Please take some time to read the information presented here, which will explain the details of this study. Please ask the researcher or person explaining the research to you any questions about any part of this study that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research is about and how you might be involved. Also, your participation is **entirely voluntary** and

you are free to say no to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part now.

This study has been approved by the **Health Research Ethics Committee of the Faculty of Health Sciences of the North West University (NWU-02071-20-A1)** and will be conducted according to the ethical guidelines and principles of Ethics in Health Research: Principles, Processes and Structures (DoH, 2015) and other international ethical guidelines applicable to this study. It might be necessary for the research ethics committee members or other relevant people to inspect the research records.

1. What is this research study all about?

- This study will be conducted at North West public nursing college in 2020 and will involve researchers with experienced health researchers trained in health research ethics. The study will include nurse educators and pre-registration nursing students at North West public nursing college.
- We plan to describe the readiness in technology usage by students and educators in a North West public nursing college.

2. Why have you been invited to participate?

- You have been invited to be part of this research because you have been identified to be knowledgeable about the subject matter which is the readiness in technology usage by students and educators in a North West public nursing college as a nurse educator or nursing student respectively.
- You also fit the research because you are affiliated with the North West public nursing college and are involved in the pre-registration teaching and learning activities.
- You will not be able to take part in this research if you are a post-registration nursing students as the focus of this study is on the pre-registration nursing students and nurse educators.

3. What will be expected of you?

You will be expected to fill in a questionnaire online (*link: <https://forms.gle/L4ekYcYdmUCsA4pQA>*) to describe the readiness in technology usage by students and educators in a North West public nursing college.

4. Will you gain anything from taking part in this research?

- There will be no direct benefits to participants. However, the indirect benefit of this study is that, the potential findings might assist policy makers to amend the policies with regard to the use of technology by students and educators in public nursing colleges in general.

5. Are there risks involved in you taking part in this research and what will be done to prevent them?

- The study has a potential of emotional risks that can be experienced by participants because they are directly involved in use of technology for teaching and learning. Participants will be informed about the available counselling services which will be arranged should they experience unpleasant emotions when filling in the questionnaire. Participants will be informed that, should they get emotional during data collection, they have the right to withdraw from the study without any punishment whatsoever and they will further be referred for counselling within NWU.

6.

7. How will we protect your confidentiality and who will see your findings?

- Anonymity of your findings will be protected by hiding your identity and making the research assistant to sign the confidentiality form. Your privacy will be respected by not disclosing your identity. All identifiers will be removed. Your results will be kept confidential by not disclosing them to third parties. Only the researchers and you as participants will be able to look at your findings. Findings will be kept safe by protecting electronic data with password. Data will be stored for five years and will only be used for the purpose agreed to by participants.

What will happen with the findings or samples?

- The findings of this study will only be used for this study and can be used in future studies with reference to this study.

How will you know about the results of this research?

- We will give you the results of this research through publication by the researcher.
- You will be informed of any new relevant findings by the researcher

Will you be paid to take part in this study and are there any costs for you?

This study is funded by the post graduate bursary and the researcher.

No you will not be paid to take part in the study because there are no expenses connected to this study.

Refreshments will not be served because the questionnaire will be filled by participants at their convenient time.

There will thus be no costs involved for you, if you do take part in this study.

Is there anything else that you should know or do?

- You can contact the researcher at 071 783 5305 or 22494952@nwu.ac.za if you have any further questions or have any problems.
- You can also contact the Health Research Ethics Committee via Mrs Carolien van Zyl at 018 299 1206 or carolien.vanzyl@nwu.ac.za if you have any concerns that were not answered about the research or if you have complaints about the research.

- You will receive a copy of this information and consent form for your own purposes.

Declaration by participant

By signing below, I agree to take part in the research study titled: Readiness in technology usage by students and educators in a North West public nursing college.

I declare that:

- I have read this information/it was explained to me by a trusted person in a language with which I am fluent and comfortable.
- The research was clearly explained to me.
- I have had a chance to ask questions to both the person getting the consent from me, as well as the researcher and all my questions have been answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be handled in a negative way if I do so.
- I may be asked to leave the study before it has finished, if the researcher feels it is in the best interest, or if I do not follow the study plan, as agreed to.

Signed at (*place*) On (*date*) 20....

.....
Signature of participant

.....
Signature of witness

Declaration by person obtaining consent

I (*name*) declare that:

- I clearly and in detail explained the information in this document to

- I did/did not use an interpreter.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above

- I gave him/her time to discuss it with others if he/she wished to do so.

Signed at (*place*) On (*date*) 20....

.....
Signature of person obtaining consent

.....
Signature of witness

Declaration by researcher

I (*name*) declare that:

- I had it explained by who I trained for this purpose.
- I did not use an interpreter
- I was available should he/she want to ask any further questions.
- The informed consent was obtained by an independent person.
- I am satisfied that he/she adequately understands all aspects of the research, as described above.
- I am satisfied that he/she had time to discuss it with others if he/she wished to do so.

Signed at (*place*) On (*date*) 20....

.....
Signature of researcher

.....
Signature of witness

ANNEXURE C: RECRUITMENT MATERIAL



INVITATION TO PARTICIPATE IN RESEARCH

TOPIC: READINESS IN TECHNOLOGY USAGE BY STUDENTS AND EDUCATORS IN A NORTH WEST PUBLIC NURSING COLLEGE

Invitation

You are hereby invited to participate in the above mentioned research by Mr Gopolang Gause from the North West University

What is this study all about?

The use of technology in all spheres of government has gained an exponential growth to a point that robots and computerized applications are doing the day to day duties. Nursing education as a whole is not immune to the implications that are brought about by the use of technology in teaching and learning in institutions of higher learning. However, there seems to be literature death on studies conducted on the use of technology for teaching and learning in public colleges including the selected campuses. The study intends to look in to the readiness in technology usage by students and educators in a North West public nursing college.

What is the aim of the study?

The aim of this study is to compare the readiness in technology usage for teaching and learning by students and educators in a multi-campus North West public nursing college.

Would this be a good fit for me?

Yes, because you are a pre-SANC registration student studying towards becoming a professional nurse or you are a nurse educator at North West public nursing college. Therefore, you are seen as knowledgeable regarding the readiness in technology usage by students and educators in a North West public nursing college.

What will happen if I decide to participate?

You will be expected to fill in a questionnaire coupled with informed consent. The questionnaire will be about the socio-demographic information, attitude towards the usage of technology in teaching and learning, content and culture readiness in use of technology, and technology readiness among educators and students.

Benefits of the study

There will be no direct benefits to participants. The potential finding might assist the policy makers to amend policies with regard to technology usage by students and educators in public nursing colleges in general

How will my rights be protected?

You have the right to decide to participate in the study and to terminate participation in the study whenever you feel uncomfortable. Anonymity of your findings will be protected by hiding your identity and making research assistant to sign confidentiality agreement form. Your privacy will be respected by not disclosing your identity.

How can I conduct the researcher should I decide to participate?

If you decide to participate, you can contact us on the following details

Mr Precious Chukwere: 073 713 1467
(chibuikeprecious@gmail.com)

Mr Gopolang Gause: 071 783 5305
(22494952@nwu.ac.za)

ANNEXURE D: STANDARD NWU CONFIDENTIALITY AGREEMENT



CONFIDENTIALITY UNDERTAKING

entered into between:

Co – Coder / Mediator

I, the undersigned

Prof / Dr / Mr / Ms _____

Identity Number: _____

Address: _____

hereby undertake in favor of the **NORTH-WEST UNIVERSITY**, a public higher education institution established in terms of the Higher Education Act No. 101 of 1997

Address: Office of the Institutional Registrar, Building C1, 53 Borchard Street, Potchefstroom, 2520

(hereinafter the “NWU”)

1 Interpretation and definitions

1.1 In this undertaking, unless inconsistent with, or otherwise indicated by the context:

1.1.1 “Confidential Information” shall include all information that is confidential in its nature or marked as confidential and shall include any existing and new information obtained by me after the Commencement Date, including but not be limited in its interpretation to, research data, information concerning research participants, all secret knowledge, technical information and specifications, manufacturing techniques, designs, diagrams, instruction manuals, blueprints, electronic artwork, samples, devices, demonstrations, formulae, know-how, intellectual property, information concerning materials, marketing and business information generally, financial information that may include remuneration detail, pay slips, information relating to human capital and employment contract, employment conditions, ledgers, income and expenditures and other materials of whatever description in which the NWU has an interest in being kept confidential; and

1.1.2 “Commencement Date” means the date of signature of this undertaking by myself.

1.2 The headings of clauses are intended for convenience only and shall not affect the interpretation of this undertaking.

2 Preamble

2.1 In performing certain duties requested by the NWU, I will have access to certain Confidential Information provided by the NWU in order to perform the said duties and I agree that it must be kept confidential.

2.2 The NWU has agreed to disclose certain of this Confidential Information and other information to me subject to me agreeing to the terms of confidentiality set out herein.

3 Title to the Confidential Information

I hereby acknowledge that all right, title and interest in and to the Confidential Information vests in the NWU and that I will have no claim of any nature in and to the Confidential Information.

4 Period of confidentiality

The provisions of this undertaking shall begin on the Commencement Date and remain in force indefinitely.

5 Non-disclosure and undertakings

I undertake:

5.1 to maintain the confidentiality of any Confidential Information to which I shall be allowed access by the NWU, whether before or after the Commencement Date of this undertaking. I will not divulge or permit to be divulged to any person any aspect of such Confidential Information otherwise than may be allowed in terms of this undertaking;

5.2 to take all such steps as may be necessary to prevent the Confidential Information falling into the hands of an unauthorised third party;

5.3 not to make use of any of the Confidential Information in the development, manufacture, marketing and/or sale of any goods;

5.4 not to use any research data for publication purposes;

5.5 not to use or disclose or attempt to use or disclose the Confidential Information for any purpose other than performing research purposes only and includes questionnaires, interviews with participants, data gathering, data analysis and personal information of participants/research subjects;

5.6 not to use or attempt to use the Confidential Information in any manner which will cause or be likely to cause injury or loss to a research participant or the NWU; and

5.7 that all documentation furnished to me by the NWU pursuant to this undertaking will remain the property of the NWU and upon the request of the NWU will be returned to the NWU. I shall not make copies of any such documentation without the prior written consent of the NWU.

6 Exception

The above undertakings by myself shall not apply to Confidential Information which I am compelled to disclose in terms of a court order.

7 Jurisdiction

This undertaking shall be governed by South African law be subject to the jurisdiction of South African courts in respect of any dispute flowing from this undertaking.

8 Whole agreement

8.1 This document constitutes the whole of this undertaking to the exclusion of all else.

8.2 No amendment, alteration, addition, variation or consensual cancellation of this undertaking will be valid unless in writing and signed by me and the NWU.

Dated at Potchefstroom this _____ 20____

Witnesses:

1

2

(Signatures of witnesses)

.....

(Signature)

ANNEXURE E: RESEARCHER CODE OF CONDUCT



CODE OF CONDUCT FOR RESEARCHERS

This code of conduct is applicable to all NWU researchers.

As a researcher of the North-West University (NWU), I subscribe to the rules of the NWU Institutional Research Ethics Regulatory Committee (IRERC) as well as all national and international laws and regulations applicable to my field of study. Furthermore, I commit myself to abide by the ethical principles and responsibilities as set out in the Singapore statement on Research Integrity (22 September 2010), in any and all research endeavours that I undertake as a researcher of the NWU.

The four major principles of research integrity to which I will adhere and that will guide my research are:

- Honesty in all aspects of research
- Accountability in the conduct of research
- Professional courtesy and fairness in working with others
- Good stewardship of research on behalf of others

Consequently I will also adhere to the following ethical responsibilities:

1. I will take responsibility for the trustworthiness of my research.
2. I will stay abreast of and adhere to all institutional, national, and international laws, regulations, and policies applicable and related to my research and research as a whole.
3. I will at all times employ appropriate research methods, base my conclusions on critical analysis of the evidence and report my findings and interpretations fully and objectively.
4. I will keep clear and accurate records of all research that I have conducted in a manner that will allow verification and replication of my work by others.
5. I will share my data and findings openly and promptly. This will be done as soon as possible after I have had an opportunity to establish priority and ownership claims.
6. I will take responsibility for my own contributions to publications, funding applications, reports and other representations of my research. I will also and only include authors who meet valid authorship criteria.
7. I will acknowledge the names and roles of those who made significant contributions to my research in publications, including writers, funders, sponsors, and others, but do not meet authorship criteria.
8. In my peer reviews, I will provide fair, prompt and rigorous evaluations and I will respect confidentiality when I review others' work.
9. I will disclose all conflicts of interest (financial and other) that could compromise the trustworthiness of my work in research proposals, publications, public communications, and in review activities.
10. When I publically address a community I will in all stages base my professional comments on research findings (if applicable) and my expertise. I will distinguish between professional comments and opinions based on personal views.
11. Should any irresponsible research practices and/or research misconduct become known to me or brought under my attention, I will report such irresponsible research activities to the appropriate authorities.
12. I will respond to irresponsible research practices or conduct, by taking prompt actions as set out in the procedures of the university. I will also protect those who report misconduct in good faith, to the best of my abilities.
13. I will endeavour to create and sustain an environment that encourage research integrity through education of students, research teams and peers, as well as abide by policies, and reasonable standards for advancement.
14. I will at all times weigh societal benefits against the risks inherent in my work.

Name: _____

Signature: _____

Date: _____

ANNEXURE F: NWU ETHICS APPROVAL LETTER



Private Bag X1290, Potchefstroom
South Africa 2520

Tel: 086 016 9698
Web: <http://www.nwu.ac.za/>

**North-West University Health Research Ethics
Committee (NWU-HREC)**

Tel: 018 299-1208
Email: Ethics-HRECApply@nwu.ac.za (for human
studies)

12 April 2021

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the North-West University Health Research Ethics Committee (NWU-HREC) on 12/04/2021, the NWU-HREC hereby approves your study as indicated below. This implies that the NWU-HREC grants its permission that, provided the general and specific conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: Readiness in technology usage by students and educators in a North West public nursing college																															
Principal Investigator/Study Supervisor/Researcher: Prof MA Rakhudu																															
Student: G Gause - 22494952																															
Ethics number:	<table border="1"><tr><td>N</td><td>W</td><td>U</td><td>-</td><td>0</td><td>2</td><td>0</td><td>7</td><td>1</td><td>-</td><td>2</td><td>0</td><td>-</td><td>A</td><td>1</td></tr><tr><td colspan="3">Institution</td><td colspan="5">Study Number</td><td colspan="2">Year</td><td colspan="5">Status</td></tr></table>	N	W	U	-	0	2	0	7	1	-	2	0	-	A	1	Institution			Study Number					Year		Status				
N	W	U	-	0	2	0	7	1	-	2	0	-	A	1																	
Institution			Study Number					Year		Status																					
Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation																															
Application Type: Single study	Risk: <table border="1"><tr><td>Minimal</td></tr></table>	Minimal																													
Minimal																															
Commencement date: 12/04/2021																															
Expiry date: 30/04/2022																															
Approval of the study is provided for a year, after which continuation of the study is dependent on receipt and review of an annual monitoring report and the concomitant issuing of a letter of continuation. A monitoring report is due at the end of April annually until completion.																															

General conditions: <i>While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:</i> <ul style="list-style-type: none">• <i>The principal investigator/study supervisor/researcher must report in the prescribed format to the NWU-HREC:</i><ul style="list-style-type: none">- <i>Annually on the monitoring of the study, whereby a letter of continuation will be provided annually, and upon completion of the study; and</i>- <i>without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.</i>• <i>The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the principal investigator/study supervisor/researcher must apply for approval of these amendments at the NWU-HREC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.</i>• <i>Annually a number of studies may be randomly selected for active monitoring.</i>• <i>The date of approval indicates the first date that the study may be started.</i>• <i>In the interest of ethical responsibility, the NWU-HREC reserves the right to:</i><ul style="list-style-type: none">- <i>request access to any information or data at any time during the course or after completion of the study;</i>
--

- to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;
- withdraw or postpone approval if:
 - any unethical principles or practices of the study are revealed or suspected;
 - it becomes apparent that any relevant information was withheld from the NWU-HREC or that information has been false or misrepresented;
 - submission of the annual monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and/or
 - new institutional rules, national legislation or international conventions deem it necessary.
- NWU-HREC can be contacted for further information via Ethics-HRECApply@nwu.ac.za or 018 299 1206

Special conditions of the research approval due to the COVID-19 pandemic:

Please note: Due to the nature of the study i.e. (online collection of quantitative data from educators and students from nursing colleges in the NorthWest), this study will be able to proceed during the current alert level, following receipt of the approval letter. This approval is based on the successful implementation of appropriate COVID-19 risk mitigation strategies as indicated in this research study. The researcher must ensure that before proceeding with the study that all research team members have reviewed the North-West University COVID-19 Occupational Health and Safety Standard Operating Procedure.

Special in process conditions of the research for approval (if applicable):

- a. Please provide the NWU-HREC with copies of goodwill permission letters from the principals of the North West public nursing colleges, granting access to the facilities.

As the study progresses the aforementioned conditions should be submitted to Ethics-HRECProcess@nwu.ac.za with a cover letter with a specific subject title indicating "Outstanding documents for approval: NWU-XXXXX-XX-XX." The letter should include the title of the approved study, the names of the researchers involved, that the documents are being submitted as part of the conditions of the approval set by the NWU-HREC, the nature of the document i.e. which condition is being fulfilled and any further explanation to clarify the submission.

The *e-mail*, to which you attach the documents that you send, should have a *specific subject line* indicating the nature of the submission e.g. "Outstanding documents for approval: NWU-XXXXX-XX-XX". The e-mail should indicate the nature of the document being sent. This submission will be handled via the expedited process.

The NWU-HREC would like to remain at your service and wishes you well with your study. Please do not hesitate to contact the NWU-HREC for any further enquiries or requests for assistance.

Yours sincerely,



Digitally signed by
Prof Petra Bester
Date: 2021.04.15
17:39:48 +02'00'

Chairperson NWU-HREC

Current details:(23239522) G:\My Drive\9. Research and Postgraduate Education\9.1.5.4 Templates\9.1.5.4.2_NWU-HREC_EAL.docm
20 August 2019
File Reference: 9.1.5.4.2

ANNEXURE G: NORTH WEST DEPARTMENT OF HEALTH APPROVAL



RESEARCH, MONITORING AND EVALUATION DIRECTORATE

Name of researcher: Mr. G. Gause
North West University

Physical Address (Work/ Institution) Corner of Albert Luthuli and University drive
North-West University
Mmabatho Unit 5, Mahikeng, 2790

Subject : **Research Approval Letter – Readiness in technology usage by students and educators in a North West public nursing college.**

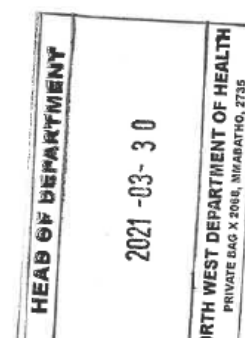
This letter serves to inform the Researcher that permission to undertake the above mentioned study has been granted by the North West Department of Health. The Researcher must arrange in advance a meeting with the District Chief Directors and District Directors to introduce their research team/members on the proposed research to be undertaken. Further to the above the Researcher must produce this letter to the Districts and chosen facilities as proof that the research was approved by the NWDH.

This letter of permission should be signed and a copy returned to the Department. By signing, the Researcher agrees, binds him/herself and undertakes to furnish the Department with an electronic copy of the final research report. Alternatively, the Researcher can also provide the Department with electronic summary highlighting recommendations that will assist the Department in its planning to improve some of its services where possible. Through this the Researcher will not only contribute to the academic body of knowledge but also contributes towards the bettering of health care services and thus the overall health of citizens in the North West Province.

Below are the contact details of Office of the Chief Directors and District Directors for Dr. Kenneth Kaunda and Ngaka Modiri Molema Districts.

Dr. Kenneth Kaunda District

Office of the Chief Director	Office of the District Director
Mr. Ishmael Moloi	Ms. Keitumetse Mlambo
IMoloi@nwpg.gov.za	KMlambo@nwpg.gov.za
018 462 5744	018 462 5744



Healthy Living for All

ANNEXURE H: DR KKD CAMPUS APPROVAL LETTER



Private Bag X2046, Mmabatho
South Africa 2735
Tel: +2718 299-389-2111
Fax: +2718 392-5775
Web: <http://www.nwu.ac.za>
School of Nursing
Tel: +27183892477
Email: 22494952@nwu.ac.za

08 March 2021

Enquiries: Mr Gopolang Gause
Attention: Mrs N Sedumedi (Campus head)
North West College of Nursing Klerksdorp Campus
Park Street, Access Park Value Center
Klerksdorp
2570
Sir/Madam

Request for permission to conduct research

The above mentioned matter bears reference

The purpose of this submission is to request your goodwill permission and ethical approval to conduct the study on **Readiness in technology usage for students and educators at a North West public nursing college.**

The aim of this study is to compare the readiness in technology usage for teaching and learning by students and educators in a multi-campus North West public nursing college.

This study will follow a quantitative approach using a comparative descriptive design. Multi-level stratified random sampling technique will be used followed by simple random sampling in each stratum to obtain a sample to be studied. The sampling frame for nurse educators will be the total population of nurse educators in each campus. An adapted Self-administered questionnaire will be used for data collection. Statistical Package for Social Science (SPSS) version 27 will be utilized to analyse descriptive statistical data.

I am currently studying Masters of Nursing science at the North-West University and employed as a simulation manager in the same university. The supervisors of the project include Prof M A Rakhuda (0822008004) and Mr IO Mokgaola (0734440288)

The study has been provisionally approved by the North-West health research ethics committee (NWU-02071-20-S1) and its final approval is subject to obtaining permission from your department (*see attached approval letter*).

Your favourable consideration of the above matter and a response at your earliest convenience will be highly appreciated.

Thanking you in advance.

Yours faithfully

Mr G. Gause

MCur Candidate

Request approved.



ANNEXURE I: NMMD CAMPUS APPROVAL LETTER

Gopolang Gause - Re: Request for permission to conduct the study

From: "Tshenolo Batyi" <batyit@nwpg.gov.za>
To: "Gopolang Gause" <22494952@nwu.ac.za>
Date: 2021/04/12 1:11 PM
Subject: Re: Request for permission to conduct the study
Attachments: Mail.ghv

Good Day Sir

This communique serves to acknowledge receipt of the letter dated 06/04/2021. You are granted a permission to conduct research at our college and presently most of the students are on block which will make your work easier as you will be able to reach them. You can avail yourself so that the college introduce you to the lecturers and students.

Hope to hear from you soon.

Regards

T.V. Batyi
Acting Campus Head

>>> "Gopolang Gause" <22494952@nwu.ac.za> 2021/04/06 14:27 >>>
Good afternoon maam

This is a follow-up request to conduct research at your institution. I have included the approval from the department of health as per our telephonic conversation

Regards

Simulation lab manager
Faculty of health sciences
School of Nursing Science
Building A13, NWU
Mahikeng Campus
Tel: 018 389 2477/071 783 5305
Email: 22494952@nwu.ac.za

NWU CORONA VIRUS: <http://www.nwu.ac.za/coronavirus/>
Vrywaringsklousule / Disclaimer: <http://www.nwu.ac.za/it/gov-man/disclaimer.html>
>>> Gopolang Gause 2021/03/18 9:41 AM >>>
Greetings maam

Kindly receive the attached documents for request to conduct research at the North West Nursing College Mahikeng campus. Attached also is the study proposal, conditional approval from NWU research ethics committee and the draft of the approval letter titled (Multicampus college) which can be amended and signed should you approve.

Thanking you in advance

ANNEXURE J: PERMISSION TO ADAPT DATA COLLECTION TOOL

Gopolang Gause - Re: Request for permission to use data collection tool

From: yosra alhity <yosraalhity@gmail.com>
To: Gopolang Gause <22494952@nwu.ac.za>
Date: 2020/10/13 7:38 PM
Subject: Re: Request for permission to use data collection tool

Good evening Sir,
Sorry, for the late reply
Concerning the questionnaire used in my study it was based on previous research with modification to apply on our students and our country
I am not sure if it would apply on your country and students.
Yet, you are welcome to use it if you think it would be useful in your study.
Best wishes of success

On Tue, Oct 13, 2020 at 5:04 PM Gopolang Gause <22494952@nwu.ac.za> wrote:

Good afternoon Maam

This is just a follow-up on the email I sent on the 06th/10/2020 regarding request for permission to use your data collection tool in my study.

هذه مجرد متابعة للبريد الإلكتروني الذي أرسلته في 06/10/2020 بخصوص طلب الإذن باستخدام أداة جمع البيانات الخاصة بك في دراستي.

hadhih mjrd mutabaeat lilbarid al'iiliktruni aldhy 'arsilath fi 06/10/2020
bkhsws talab al'iidhn biastikhdam 'adat jame albayanat alkhasat bik fi dirasti

Regards

Mr G Gause
BNSc, BN-Edu, Health Service Mangement
Faculty of health sciences
School of Nursing Science
Building A13
NWU, Mahikeng Campus
P/Bag X2046, Mmabatho, 2745, ZA
Tel: 018 389 2477/071 783 5305
Email: 22494952@nwu.ac.za

NWU CORONA VIRUS: <http://www.nwu.ac.za/coronavirus/>

Vrywaringsklousule / Disclaimer: <http://www.nwu.ac.za/it/gov-man/disclaimer.html>

>>> Gopolang Gause 2020/10/06 4:19 PM >>>

Good afternoon maam

I am Mr G Gause from North West University in South Africa. I would like to request a permission to use you data collection tool in my masters study. The data collection tool referred to is the one that was used in a study "E-learning readiness from perspectives of medical students: A case study of university of Fallujah"

Thanking you in advance

Regards

Mr G Gause

ANNEXURE K: PROOF OF STATISTICAL CONSULTATION

281, Onkgopotse Tiro St.
Unit 7, Mmabatho,2735

27/10/2020

To whom it may concern

Dear Sir/ Madam,

RE: Proof of Statistical Consultation

This serves to confirm that I have reviewed Gopolang Gause's (22494952) proposal and questionnaire titled "Readiness in use of technology by students and educators in North West public nursing college".

I guided the student regarding the correct statistical methods that he needs to use in order to address the objectives of her study. These include the structure and phrasing of the questionnaire, determination of the sample size and sampling methods, and the proposed statistical analysis methods as reflected in his proposal.

In light of the above, the statistical analyses proposed for this study will be able to address all the objectives of the study.

Yours sincerely,

Dr Volition
Montshiwa

Digitally signed by
Dr Volition
Montshiwa
Date: 2020.10.27
15:13:14 +02'00'

PhD in Statistics

tlhavolmon@gmail.com

0741074981

ANNEXURE L: PROOF OF LANGUAGE EDITING



Office: 0183892082

FACULTY OF EDUCATION

Cell: 0782295700 / 0789175805

Date: 05/10/2021

TO WHOM IT MAY CONCERN

CERTIFICATE OF EDITING

I, Sifiso Sibanda, confirm and certify that I have read and edited the entire dissertation: *Readiness in technology usage by students and educators in a North West public nursing college* by G. Gause, Student number: 22494952 submitted in fulfilment of the requirements for the degree *Master of Nursing Science (MNSc)* at the North-West University, which was supervised by Mr IO Mokgaola and co-supervised by Professor MA Rakhudu of the North-West University.

I hold a PhD in Language and Literature with English and am qualified to edit academic work of such nature for cohesion and coherence.

The views and research procedures detailed and expressed in the dissertation remain those of the researcher/s.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Sibanda', followed by a horizontal line.

Sifiso Sibanda

(PhD, MA, BA Honours, B.Ed., D.Ed. – English)

