Are Nurse Academics Technology Ready? A Mixed Methods Study of Australian Nurse Academics' Attitudes to Technologies in Teaching

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Abstract

Technology use in higher education teaching has become widespread and ubiquitous, affecting many areas of teaching and learning (Bond et al., 2020). Nurse education has been impacted by this shift with increasing use of technologies in the classroom (Koch, 2014). Although there has been a large research focus relating to students' elearning, there has been less focus on the academic and their elearning role, in particular, how academic attitudes influence technology use in teaching (Drysdale et al., 2013; Martin, Polly, et al., 2020). The aim of this study was to explore nurse academics' attitudes to technology and the influence attitude has on their use of technologies in teaching. There were three objectives:

1) To investigate nurse academics' attitudes to technology through the Technology Readiness Index 2.0 (TRI 2).

2) To develop an understanding of how and why nurse academics engage with technology through individual interviews.

3) To integrate the quantitative (Objective 1) and qualitative (Objective 2) findings in order to gain a holistic understanding of academics' use of technologies in teaching.

A mixed methods sequential explanatory design consisting of two phases was used to address the aim. The first phase was a survey based on a previously validated, 16 item questionnaire, the Technology Readiness Index 2.0 (TRI 2), which was distributed to Australian nurse academics. The second phase included semi-structured individual interviews focussed on academics' use and attitudes to technology, incorporating elements from the survey.

The Technology Readiness Index 2.0 (TRI 2) was used in this study for the first time with nurse academics. The phase one findings indicate that nurse academics were technology ready, had higher overall TRI mean score than the general population (Parasuraman & Colby, 2015), but with similar outcomes to previous nurse academic research. Of note was that TRI was significantly associated with frequency of technology use, number of technologies used and self-rated confidence to use technology.

The findings revealed three main Technology Readiness groups, representing three attitudes to technology in teaching: Explorers, Sceptics and Hesitators. Explorers were found to be innovative, positive and confident in their use of technology; Sceptics showed aversion to technology, were cautious when considering the impact on pedagogy and concerned about the impact on interpersonal skills; Hesitators showed preference for traditional teaching and distrust and were anxious about technology use. Overall, attitudes were found to be complex, based on experience and the potential impact technology may have on nursing students.

The groups identified in this thesis explain behaviours and enable institutes to support academics in their engagement with technology. Recommendations include flexible training to meet the needs of academics, the use of simple and reliable technology across TR groups and adjusting workloads to account for the time-consuming nature of technology. There is also a need for academics to consider their attitudes to technology and the impact this may have on their teaching. This thesis demonstrates that technology engagement is not a binary choice but a complex process based on attitudes and other factors.

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I acknowledge the Traditional Owners of the land where I work and live, the Bunurong/Boonwurrung of the Mayone Bulluk Bunurong/Boonwurrungcan and pay my respects to Elders past, present and emerging.

This thesis contains no material which has been accepted for the award of any other degree or diploma ay ant university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Mark Browning

10/12/2022

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This study received ethical approval from Federation University Human Research Ethics Committee

Principal Researcher:	Professor Simon Cooper
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Quote the Project No: A18-088 in all correspondence regarding this application.

Approval has been granted to undertake this project in accordance with the proposal submitted for the period listed above.

Please note: It is the responsibility of the Principal Researcher to ensure the Ethics Officer is contacted immediately regarding any proposed change or any serious or unexpected adverse effects on participants during the life of this project.

In Addition: Maintaining Ethics Approval is contingent upon adherence to all Standard Conditions of Approval as listed on the final page of this notification.

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Fiona Koop

For my wife, Mary, without her I would not have completed this journey. I deeply love you.

For my children, Ty, Cadi and Ada, who bring me joy.

List of Abbreviations and Glossary

AIHW – Australian Institute of Health and Welfare (Independent statutory Australian Government agency producing authoritative and accessible information and statistics)

HEI – Higher Education Institution (referred to as institute in this study)

NHMRC – National Health and Medical Research Council (Australia's peak body for supporting health and medical research; for developing health advice for the Australian community, health professionals and governments; and for providing advice on ethical behaviour in health care and in the conduct of health and medical research)

TRI – Technology Readiness Index

Academic – Term used to refer to those teaching in higher education (also known as lecturers, professors or faculty)

elearning – The use of technology in teaching and learning. Note there are variations of the spelling and formatting of term (e.g. eLearning/e-Learning). This study uses elearning.

Technology – Refers to any information and communication technology including online, synchronous/asynchronous.

Chapter 1: Introduction

1.1 Introduction

The increasing presence of technology in human lives has impacts on various aspects of how we live. This includes education where the ubiquitous presence of technology has impacted all levels of education, from pre-school to higher education (Raja & Nagasubramani, 2018). Adoption of technology, particularly in higher education, has been a gradual process, with academics having influence over how much technology they include in their teaching (Tondeur et al., 2019). Academics' attitudes towards technologies has an impact on how that technology will be integrated into their teaching (Alves et al., 2020). They model attitudes to students and also influence how much technology they use within their teaching. This can mean that academics act as gatekeepers to technology use (Tondeur et al., 2019).

Nurse education has been part of this change with the increasing technology use to prepare nursing students for an increasingly technology-rich profession (Schwartz, 2019). However, nursing is a complex discipline involving science-based knowledge applied in a therapeutically caring way to uniquely individual persons (Bhana, 2014). Nurse academics are tasked with meeting the increasing technology use in higher education and preparing nursing students for the technology-rich profession while developing students' abilities to therapeutically interact with clients.

Despite the existence of technology use in nurse education for some time, the use of technologies in teaching varies significantly between academics (Petit dit Dariel et al., 2013). Given similarities in terms of support and resources available to nurse academics, the difference in technology adoption may be due to differences between academics. The academic's attitude to technologies in teaching is one area that may impact the engagement and adoption of technologies in teaching and is the focus of this thesis. This thesis uses the

term ‘technology/ies in teaching’ to describe the use of information and communication technologies within teaching. The definition is based on the elearning definition by Jereb and Smitek (2006, p. 115) that “elearning [technology in teaching] refers to educational processes that utilise information and communications technology to mediate synchronous as well as asynchronous learning and teaching activities”. The term is designed to be broad to capture the many ways in which academics engage with technology in their teaching.

1.2 Chapter outline

This chapter presents a brief history of technology in higher education and the current trends in technology use in teaching. The subsequent part of the chapter considers the individuals affected by technology: the student and the academic. Discussed next is the impact of discipline, in particular consideration of the nursing discipline and the affect this may have on technology use. A brief discussion of the research of nurse academics and technology in their teaching demonstrates the current state of literature on the topic. The impetus for the study is explained, where the researcher relates the experiences that gave rise to interest, and subsequently, this study. The final section of the chapter describes the research aims and outlines the thesis structure.

1.3 A brief history of technologies in teaching

The development of technology in teaching has been connected to the development of technical improvements, increased affordability and increased access to technology (Hubackova, 2015). Computers in higher education were first used in the 1940s and 1950s purely for research (Fallows & Bhanot, 2002). This was due to the high cost and rarity of such computers which prevented access and development of instructional material. In the 1980s, the personal computer arrived, improving access and the potential for computer use in education. However, early instruction involved bespoke programs that were primarily text

based (Fallows & Bhanot, 2002). Computer education media still had a physical element with the use of floppy disc or CD-ROMs to contain educational material. This meant that utilising the personal computer for teaching and learning was time consuming and required significant resources to create teaching content. The invention of the World Wide Web in the 1990s led to a significant increase in the availability of, and potential for, elearning as features such as multimedia, graphics and links could be incorporated into the learning programs (Hubackova, 2015). This reduced the time required to implement teaching content and increased scale as one resource (such as a website) could be viewed by many learners, reducing distribution costs and resources. This was further enhanced with Web 2.0, which is summarised by Bennett et al. (2012) as encompassing technologies that allow individual and collective online publishing such as sharing of images, audio and video; and creation and maintenance of online social networks. The change is also considered to have shifted the focus from teacher to student focussed, allowing more student-to-teacher and student-to-student interaction (Sun et al., 2014). At the same time, personal computing costs were decreasing and internet speeds were increasing, enabling the common use of personal computers (Roberts, 2000).

The evolution of technology from niche research applications to everyday use has led to the current situation within higher education, where technology use to facilitate learning has become commonplace (Johnson et al., 2012). Current technology learning trends include virtual reality or augmented reality, mobile learning (or learning through mobile devices) and the use of created audio-visual (Thompson et al., 2021). The use of blended and online learning, although not new, continues to develop in line with design and support systems (Thompson et al., 2021). The 2021 Educause Horizon report discussed current technology trends including increase in hybrid (blended) learning, increase in use of learning technologies and the need for ongoing faculty support (Pelletier et al., 2022). Furthermore, the COVID-19 pandemic has had a significant impact on the higher education sector, with the majority of courses transitioning to online mode to enable students to continue to study

during this time (Pelletier et al., 2022). As a result, higher education institutions are now implementing more online and hybrid (blended) learning, increasing the number and diversity of courses that students can now engage with, using technology (Pelletier et al., 2022). Due to this, academics must now utilise the varying technologies to create, manage and implement their teaching. The use of technology is a dynamic process, which can be influenced by pedagogy, infrastructure, student behaviour and academics' attitudes (Brown, 2016). The learning relationship between content, student and teacher is impacted by how and why technology is used (Anderson, 2011). As seen in Figure 1.1, the three areas interact, with students and academics (labelled as 'teacher' in the figure) having agency in terms of how they use technology in their interactions with each other and educational content. Importantly, the academic exerts a degree of control over how they interact with students (via technology or not) and has influence on the manner in which students can access the learning content (such as e-readings or recorded informative video or web-conferencing).

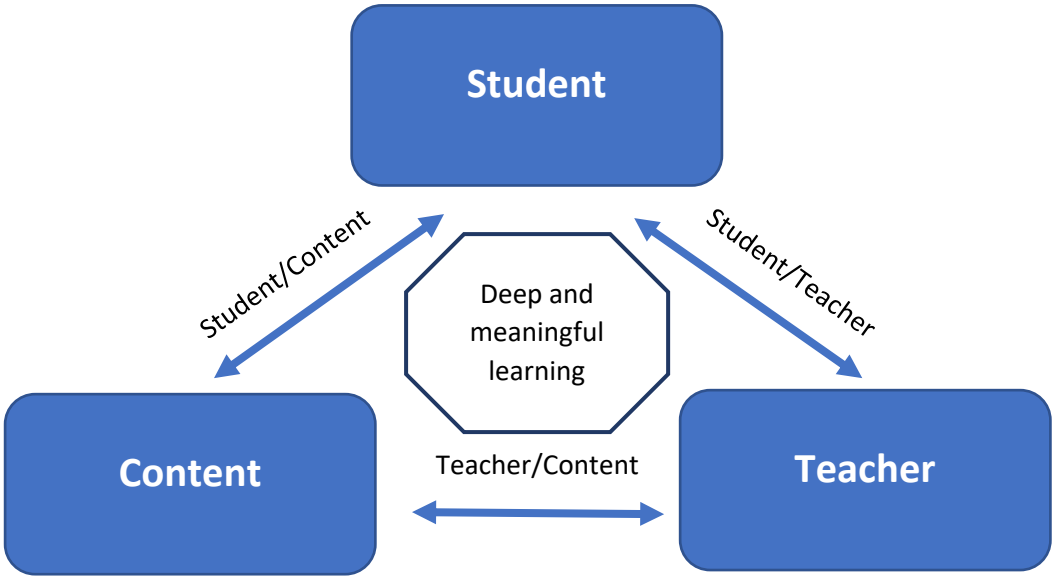

Figure 1.1 Interaction of Student, Content and Teacher in Technology Based Learning

Figure adapted from Anderson (2003)

Essentially, this allows the academic to influence the degree of technology use in the teaching/learning process. The next section considers the impact of technology on students and academics in higher education.

1.4 Students and technology

Students are inevitably affected by the increased technology use in teaching. The effect of technology on students and their satisfaction of elearning has been well studied (Drysdale et al., 2013). Several systematic reviews have identified that elearning is as effective as traditional educational methods (Castro & Tumibay, 2021; Müller & Mildenberger, 2021). In a meta-analysis of efficacy of online learning courses for higher education, Castro and Tumibay (2021) found that learning outcomes, student satisfaction, time and learning efficiency and the effectiveness of problem-based learning, online learning is at least as effective as traditional face-to-face learning. Similarly, Müller and Mildenberger (2021), in a systematic review of blended learning in higher education, found that although blended learning reduced classroom time between 30 and 79 per cent, no adverse effects on learning outcomes were found. Finally, in a study comparing elearning to traditional learning for health professional students, George et al. (2014) found that knowledge, skills and satisfaction, were as good as or improved in elearning over traditional teaching methods. Overall, the impact of increased technology use on students seems to have had little impact on their learning and may have provided benefits as seen in the outcomes of the studies discussed. However, students have little control over how or why technology is used in the courses they are enrolled in, as this is determined by the institute and academic.

1.5 Academics and technology

The academic (also known as instructor, lecturer or teacher but referred to as ‘academic’ in this thesis) plays a critical part in the adoption and implementation of technology in their

teaching (Alves et al., 2020). As seen in Figure 1.1, the teacher interacts with both students and content through technology, which demonstrates the direct interaction with students (modelling behaviour) and indirect technology use (how much or little technology is used in relation to content and teacher interaction). Yet there is evidence that lecturers have low adoption rates of technology and those who do adopt technology do so from a teacher-centred, rather than student-focussed, perspective (Alves et al., 2020). The Technology Outlook for Australian Tertiary Education 2013-2018 identified that academics were one of the challenges to implementing technology in tertiary education, noting that students needed teachers to embrace and integrate technology so students in turn could learn to use it effectively (Becker et al., 2016). Even as education institutes have implemented technology, academics still have control over how much technology is incorporated into their courses and the enthusiasm with which they use said technology in their teaching, with Tondeur et al. (2019, p. 1194) describing academics as "gatekeepers for technology integration in [higher] education". This demonstrates the influence that academics have on technologies within their teaching.

Despite the role academics play in elearning, there are few studies on the area of technology and teaching from the academic perspective (Mesquita et al., 2017). In a systemic review of online learning and teaching from 2009 to 2018, Martin, Sun, et al. (2020) found research focussed on the instructor accounted for 21 of the 619 (3.4%) publications reviewed compared to 345 leaner focused publications (55.7%). This indicates a lack of research in this area and the need for further research to examine and understand teaching with technology from an academic perspective.

Several systematic reviews have considered the academic and technologies in teaching. It is worthwhile to do so, as the reviews consider the broader aspects of technology, rather than focussing on a specific technology and the academic's interaction with it. Reid (2014) conducted a review of the literature on barriers to instructor adoption, Brown (2016) reviewed literature in relation to factors which shape faculty members' adoption and use of

online tools in face-to-face teaching (blended learning) and Liu et al. (2020) performed a systematic review of literature regarding academics' adoption of learning technologies. None of the reviews set publication date limits in an attempt to capture as much relevant literature as possible; however, this creates a limitation on the studies as publication dates of some research means that technology advancements may make some findings irrelevant. There were several common themes across the reviews. Technology itself was a theme, with complexity, reliability, ease of use, relative advantage and lack of access being issues raised (Brown, 2016; Liu et al., 2020; Reid, 2014). Workload was another issue with all reviews noting that engaging with technology was seen as time intensive and reduced the time for other academic pursuits (such as research). In relation to workload, recognition and reward for engaging with technology was also a common theme, as engaging with technologies was not acknowledged in terms of time commitment or career progression (Brown, 2016; Liu et al., 2020; Reid, 2014). Students were seen as having a desire for learning technology and needing support for such (Brown, 2016; Liu et al., 2020; Reid, 2014). Academics' technology skills were common across all three reviews with the requirement for training and support to engage with technology, while having a wide variety of capabilities using technology. Generally, academics were viewed as lacking knowledge in the potential technologies that they could employ in their teaching; however, they were familiar with more common ubiquitous technology, such as email and learning management systems (Liu et al., 2020).

The attitudes of academics was a finding discussed in each review. Brown (2016) considered that attitudes were internal influences, with academics bringing their own ideas and beliefs about teaching and technology. It was found that technology-averse attitudes were likely to prevent or slow technology adoption and that a change in beliefs towards online tools might be necessary for those academics to engage. In addition, pedagogical beliefs also appeared to influence blended learning practice. Teaching aspects that might be impeded by blended learning, such as improvisation or use of non-verbal cues, were seen to potentially influence attitudes to technology use (Brown, 2016). Liu et al. (2020) found that

there were typologies of adopters, grouping academics into adoption categories such as “innovators and laggards” or based on their stage of adoption. The typology was suggested to be influenced by attitude to change, control, academic technology capability and pedagogical beliefs. Reid (2014) found that faculty attitudes consisted of resistance to change, technology self-efficacy and perception of technology effectiveness. Each aspect affected the academic’s adoption of technology, either as an enabler or barrier to adoption. Importantly, there is also a link between academic attitudes to technology and student satisfaction and acceptance of technology in their learning, indicating that academics play a role in modelling attitudes to technology towards students (Brown, 2016; Taat & Francis, 2020).

The literature demonstrates that there are numerous factors influencing adoption and implementation of technology. However, academics themselves are often overlooked in the research on technology in teaching. The above research has considered academics in general, but the focus of this current study is the nurse academic and their engagement with technology in teaching. The next section considers the influence of discipline on technology in teaching.

1.6 Discipline and technology

Differing disciplines use technology in different ways and for different purposes, such as use of synchronous or asynchronous communication (Fathema & Akanda, 2020). Biglan’s typology of academic disciplines is commonly used to differentiate the various disciplines in higher education when discussing technology use (Doberneck & Schweitzer, 2017). Biglan (1973) had three features used to classify academic areas: a) the degree to which there is paradigm consensus in the discipline referred to as *hard* (high consensus) or *soft* (low consensus), b) the degree to which the discipline is concerned with practical application and c) makes a distinction between disciplines concerned with living organisms opposed to those which do not. The focus of this study is the discipline of nursing, which is categorised as a

soft/applied/life discipline (Doberneck & Schweitzer, 2017). Prior research has demonstrated that the discipline of the educator influences their interaction with technology in teaching (Fathema & Akanda, 2020). Hard-pure and hard-applied disciplines view technolgoy as needing to enable them to upload lage files, write formulas and create complex audio/visual presentations while soft-applied and soft-pure are more concern with communicating through the technology (Fathema & Akanda, 2020). Nurse education is a person-centred, science-based, flexible yet critical thinking discipline, which influences the way nurse academics interact with technologies in their teaching. The study focus on nursing will reveal the unique attitudes of nurse academics and the ways in which they engage with technology.

The discipline of nursing is also influenced by those who teach into it. The average age of Australian nurse academics is 47.9 years old and the profession is predominately female gendered with 88% identifying as female (Australian Institute of Health and Welfare, 2019). Compared to Australian academics overall, 43.3 years old and 58% identifying as female, the nurse academic is likely to be older and much more likely to identify as female (Department of Education, 2021). In addition, nurse academics generally come from the nursing practice workforce, where technology ability is not necessarily a valued attribute and may present another unique aspect to nurse academics' attitudes to technology (Rababah et al., 2021). The attributes described above, which are unique to the nursing discipline, likely play some role in the ways in which nurse academics interact with technology and the attitudes to technology that they hold. It also indicates that attitudes to technology may be formed before nurse academics are teaching in higher education. The next section discusses nursing education and technology.

1.7 Nursing education and technology

Nursing education is impacted by the need for students to graduate ready to work in the nursing profession (Felton & Royal, 2015). Within the health care sector, there has been an increase in the technology use to deliver care to the clients who access health care services

(Aceto et al., 2020). This includes such things as digitisation of pathology results, electronic medication records and telehealth, as well as more advanced applications such as the internet of things (Aceto et al., 2020). This presents a dual challenge for nurse academics who must manage the increasing technology use being utilised to deliver nursing education, while incorporating technologies from clinical practice to prepare students to use such technologies. In addition, the nursing profession values interpersonal skills, which can be at odds with technology use, with a fear that technology may impede development of client-nurse interactions (Bhana, 2014).

Given this context, research on nurse academics and technology has tended to focus on specific technologies, rather than a broader view of technology. Studies have focussed on iPad integration, electronic medical records or lecture capture technology (Freed et al., 2014; Kowitlawakul et al., 2014; Stec et al., 2020). While these studies are necessary and provide insights into the implementation, barriers, development and support required for the specific technologies, they risk becoming outdated when technology inevitably changes. There is also concern that issues associated with one technology may not be present in another, such as new iterations of software/hardware gaining or losing functions. However, there may also be some specific experiences that are applicable to technology as a whole. Research that considers nurse academics and technology more broadly has been completed; however, the focus tends to be on the experience of change, for example, from face-to-face to online or developing blended learning curricula (Porter et al., 2020; Sweeney et al., 2016). There is a particular lack of research on nurse academics and technologies in teaching based in Australia, the location of the current study. There is also a lack of research focussed on the impact the academic can make on technologies and a lack of research on broad attitudes to technology. Further analysis and discussion of the previous research in the area of nurse academics and technologies in teaching is presented in the literature review (Chapter 2) of this thesis.

1.8 Impetus for the study

The preceding overview of some of the factors impacting the technology use in teaching gives some insight into the impetus for this study. The increasing prevalence of technology combined with the lack of research on the nurse academic, influenced the focus of this study. The researcher is a nurse academic who has taught undergraduate courses for ten years and had noticed a wide range of attitudes and uses of technology in teaching. Despite having access to the same resources and having similar experiences of teaching, the researcher's personal experience was implementation of technology within courses and, between academics, could vary significantly. The researcher was perplexed as to why this was occurring and why the variation was so wide and this led to the impetus for this study.

1.9 Research Aims and Objectives

The overall aim of the study was to explore nurse academics' attitudes to technology and the influence attitude has on their use of technologies in teaching. There were three objectives:

1) To investigate nurse academics' attitudes to technology through the Technology Readiness Index 2.0 (TRI 2).

2) To develop an understanding of how and why nurse academics engage with technology through individual interviews.

3) To integrate the quantitative (Objective 1) and qualitative (Objective 2) findings in order to gain a holistic understanding of academics' use of technologies in teaching.

The research was underpinned by the methodological concept of pragmatism, informed by the work of John Dewey (1859–1952). Dewey was a philosopher and educationalist who believed that research should aim to benefit humankind, rather than be a pursuit of truth or reality (Parvaiz et al., 2016). As such, pragmatist paradigm places the central focus on the research question and how best to answer this. Therefore, the aims of the research were

addressed through a mixed methods design comprising two phases of data collection. Phase one was based in the quantitative paradigm and measured nurse academics' attitudes to technology using a survey. A reliable and validated tool was used to measure attitude to technology, the Technology Readiness Index 2.0 (Parasuraman & Colby, 2015b). The Technology Readiness Index 2.0 is a 16 item questionnaire that measures the propensity of an individual to utilise and adopt technology, discussed at length in Chapter 3 (Parasuraman & Colby, 2015). Phase two developed an understanding of nurse academics' engagement with technology through interviews. The interviews were semi-structured and initial outcomes from the survey guided parts of the interview. Synthesis of Phase one and Phase two data addressed the final research aim. Merging technology readiness and the academic perspective on teaching with technology, the study explored how and why nurse academics engaged with technology and the impact of attitude on technology use.

1.10 Original contribution to knowledge

The thesis' original contribution to knowledge is the findings from the Technology Readiness Index Version 2.0 as applied to nurse academics, and the findings relating to the influence of attitudes. The research identifies technology readiness groups and explores the characteristics of these groups in terms of attitudes to technology. The perspective of the Australian nurse academic is explored and discussed, creating knowledge in a largely unresearched area. Finally, broader attitudes and influences on nurse academic technology use are reported, creating potential for more general application of the findings. The findings demonstrate the complex interplay of technology, support, frame of reference and academic concerns that contribute to the attitudes held by nurse academics to technology.

1.11 Thesis structure

Chapter 1: Introduction has described the historical aspects and significance and context of the study. The research aim and the methods used to attain the findings were established.

Chapter 2: Literature review reveals the findings from previous research around the topic of attitudes to technology of nurse academics. The influence of other aspects identified within the literature related to technology, such as time and complexity, are also discussed.

Chapter 3: Methodology and Methods describes the mixed methods used, with the philosophical underpinning of pragmatism. The chapter describes the philosophical decisions made in developing the phases of the research design. The chapter then describes the quantitative methods used to collect data via the survey in phase one and the statistical analysis in this phase. This is followed by a description of the qualitative methods, including the semi-structured individual interviews and the thematic analysis used.

Chapter 4: Phase one Quantitative results presents the descriptive and inferential statistical analysis of the survey.

Chapter 5: Phase two Qualitative results presents the findings from the semi-structured interviews and themes emerging from the thematic analysis.

Chapter 6: Discussion of Integrated Findings, Recommendations, Implications and Conclusions provides an understanding of the phenomenon through discussion of the integrated findings and the relevant literature. The study's limitations are discussed while implications and recommendations are made. Future direction of further research in this area is also discussed and the thesis is concluded.

1.12 Summary

This chapter presented a brief summary of the history of technologies in teaching whilst noting current technology trends. The implications of technology on students and academics

were discussed and the effect of discipline on academic interaction with technology was explored. Further, the impact of technology on nurse education was described, including a brief summary of the previous literature on nursing attitudes identifying the key gaps. Finally, the research aim and objectives were stated, followed by an outline of the thesis chapters. The next chapter provides a review of the literature on nurse academics' attitudes to technologies in teaching.

Chapter 2: Literature Review

2.1 Introduction

The previous chapter considered the history of technology and the impact technology has had on education, in particular, nursing education and the nurse academic. This chapter presents a review of the literature on nurse academics' attitudes to technologies in teaching. The use of technology in higher education teaching is becoming more prevalent, to the point where it is now considered the "new normal" (Brown, 2016). Nurse education has been impacted by this shift with increasing use of technology in the classroom (Koch, 2014). This includes elearning, blended learning, online learning and technology within classroom settings (such as instant electronic polling). The effect of this on students and their learning has been well documented, with students reportedly satisfied with elearning (Drysdale et al., 2013) and several systematic reviews finding that elearning is as effective as traditional educational methods (Castro & Tumibay, 2021; Müller & Mildenberger, 2021; Al-Shorbaji, 2015; Lahti et al., 2014).

Increasing technology in teaching has also impacted academics. Technology changes the teaching role, creating possible tension for the academic who has to adapt (O'Neill et al., 2004). These changes leave academics reluctant to embrace available technology due to the potential educational issues they create (Singh et al., 2005). Academics' integration of technology is essential, as their behaviour can motivate students' behaviour and enhance educational processes with technology (Hammoud et al., 2008). Academics play a key role in the integration of technology in teaching as it is the academic, not the technology, who facilitates students' learning experiences (Singh et al., 2005). Therefore, academics act both as gatekeepers to technology within their classes and as an example with regard to their technology attitudes.

Amongst the academic disciplines, nursing has several unique characteristics. This is described through Biglan's taxonomy of academic disciplines (see Figure 2.1). Nursing is

both a soft discipline that has a knowledge base that is interpretive and is an applied discipline, that involves real world application of knowledge (Neumann et al., 2002). This means that nursing knowledge is applied to people and is unpredictable, requiring a high level of critical thinking skills by students and nurses (Smith et al., 2009).

Domains	Pure	Applied
Hard	Mathematics, Natural Sciences: physics, chemistry, biology, etc.	Engineering, Applied Mathematics
Soft	Social Sciences, Humanities: sociology, anthropology, psychology, etc.	Nursing, Education

figure sourced from Smith et al. (2008)

Figure 2.1 Biglan's taxonomy of academic disciplines

In addition, nurse education focusses on the importance of interpersonal skills, such as patient interaction, education and rapport (Bhana, 2014). Nurse academics are tasked with using technology in teaching that allows development of critical thinking skills and interpersonal skills. This study therefore focussed on nursing due to these unique aspects in order to explore how technology impacts nursing rather than academics across disciplines. A broader review may have overlooked the nuances that nurse academics have in their approach to teaching using technology.

The review in this chapter aims to describe literature related to nurse academics' attitudes to teaching with technology. The intention was to build a baseline understanding of available knowledge to inform the subsequent doctoral study, by highlighting gaps in existing knowledge that require further investigation. This literature review, not only reports on the claims in the existing literature, but also critically examines the research methods employed

to substantiate assertions. This type of comprehensive review allowed the researcher to summarise the existing literature and synthesise it to generate new perspectives.

This chapter outlines the methods used for the review, including the search strategy, selection of studies, inclusion and exclusion criteria, and resulting search outcomes. Thematic analysis was undertaken to identify and extract common themes from the existing literature. This analysis presents the seven main themes identified from within the literature and the chapter concludes with a summary of the findings from the literature and the strengths and weaknesses of the literature review.

2.2 Search Strategy

A systematic search of the literature was performed using a selection of electronic databases in order to locate articles that focussed on nurse academics and technology. Although the main focus of the search was peer-reviewed, primary research articles, secondary sources, such as literature reviews, were accessed to both inform the study and identify potential primary sources.

The electronic databases listed below were used to search for primary sources, published between 2010 and early 2022, to examine contemporary knowledge relating to nurse academics and their technology use in undergraduate programs. Databases were selected on relevance to nursing and education and included: CINAHL, MEDLINE, ERIC, Psychinfo and A+ informit, which were accessed through the Federation University Library. Manual searches based on the reference lists and bibliographies of articles (particularly secondary articles) and reports relevant to the search topic were also performed. The search was performed using the following keywords and Boolean operators in order to fully capture the elements of technology: comput* OR mobile OR online OR technol* OR elearning OR web OR "blended learning" OR "learning management system*" OR digital OR eteaching OR e-teaching. In order to capture academics, the following keywords were used: universit* OR

tertiary OR lectur* OR college* OR academic* OR educator OR faculty. Finally, the nursing discipline was identified using: nurs*. In addition, the published year was prescribed (i.e. 2010–2022) and the language of publication was English.

2.2.1 Inclusion and exclusion criteria

Inclusion and exclusion criteria were based around the Participants, Intervention, Comparison, Outcomes (PICO) framework (Shokraneh, 2016). Participants were nurse academics/academics/educators, defined as those teaching nursing in Higher Education Institutions (HEIs, also referred to as institutes in this thesis). Other health care professions were excluded, to allow the nursing perspective to be apparent. Students were also excluded as they are the end users of teaching with technology, rather than the gatekeepers. Manager or administration viewpoints were also excluded as these groups have little involvement in direct teaching and the effects technology has on teaching. Studies that combined cohorts (such as students and academics, or nursing and other disciplines) were only included if the academic or nursing aspect of the study was clearly delineated from the student or other disciplines. The Intervention was teaching with technology. This included elearning, blended learning, online learning, video-lecturing. Simulation was excluded and defined as, “a technique, not a technology”, (Gaba, 2007, p.126) indicating that simulation is more an attempt to create immersive learning, which while it may use technology, is more a technique with a specific use of technology. Simulation is also linked to clinical teaching, which excludes nurse academics who do not teach into the field.

The inclusion criteria included any papers that gave voice to the academic’s experience of teaching with technology, such as attitudes, concerns, barriers, and effect of technology. Primary research papers were included whilst expert opinion, single case studies, discussion papers and framework or implementation studies were excluded.

Studies were included if published between January 2010 and March 2022 in peer reviewed journals. This time limit was chosen due to the changing nature of technology, ensuring that studies had relevance to contemporary educational technology. Studies published in languages other than English were also excluded.

2.2.2 Appraisal

The Australian National Health and Medical Research Council (NHMRC) Evidence Hierarchy was used to evaluate all studies (National Health and Medical Research Council, 2009). Specific appraisal tools were also selected for in-depth quality appraisal including the McMaster Critical Review Form for quantitative studies (Law et al., 1998), the CASP tool for qualitative studies (Critical Appraisal Skills Programme, 2018) and the McGill University Mixed Methods Appraisal Tool (MMAT) – Version 2011 (Pluye et al., 2011). A score out of ten was given to each study using the various outlines of each tool and their recommended scoring technique (See appendix A, B and C).

2.3 Search Outcomes

Initial searches identified 3,190 studies and a review of abstracts with inclusion/exclusions based on the PRISMA was applied, see Figure 2.2 (Page et al., 2021). Limits of peer reviewed, primary research, English language and year limits (2010-2022) were applied reducing eligible studies to 1946. Title and abstracts of the studies were reviewed according to the inclusion criteria discussed above, leaving 157 for more detailed review. A further 112 studies were then excluded and critical appraisal of the remaining 45 articles led to the exclusion of seven additional articles, leaving 38 studies for full thematic analysis. A full analysis of the included studies based on the appraisal tools was conducted and is included in table form in appendix A, B and C.

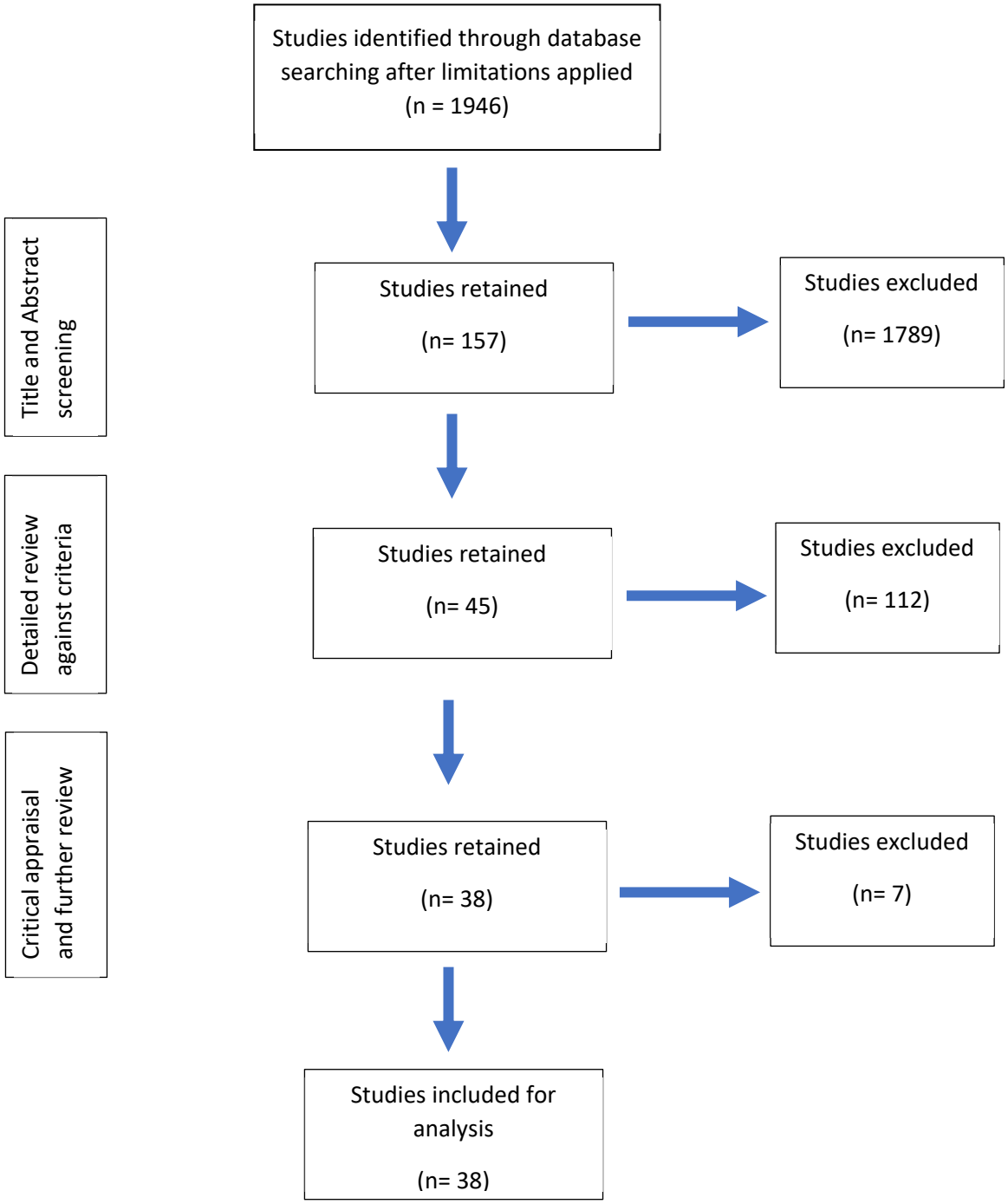

Figure 2.2 Flow diagram of search and inclusion/exclusion criteria

Adapted from: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009)

2.3.1 Country of origin

Studies included in the review were conducted in 14 countries (see table below). The largest number came from the United States of America (n=21) followed by the United Kingdom (n= 4). Only one study from Australia was included (Porter et al., 2020).

Table 2.1 – Study country of origin

Country of origin	Study Author and year
USA (n=21)	Abell and Garrett-Wright (2014); Ali et al. (2017); Broussard and Wilson (2018); Burke and Ellis (2016); Buxton et al. (2015); Freed et al. (2014); Gazza (2017); Hampton et al. (2020); Howe et al. (2018); Jones et al. (2016); Kotcherlakota et al. (2017); Nguyen et al. (2011); Richter and Idleman (2017); Robinia and Anderson (2010); Roney et al. (2017); Sinacori (2020); Smith and Crowe (2016); Stec et al. (2020); Sword (2012); Tacy et al. (2016); Wingo et al. (2016)
UK (n=4)	Allan et al. (2012); Moule et al. (2010); Petit dit Dariel et al. (2013, 2014)
Australia	Porter et al. (2020)
Brazil	Alves et al. (2020)
Finland	Jokinen and Mikkonen (2013)
Greece	Tzitzolaki et al. (2014)
Ireland	Sweeney et al. (2016)
Israel	Gonen and Lev-Ari (2016)
Jordan	Nabolsi et al. (2021)
Lebanon	Nsouli and Vlachopoulos (2021)
Singapore	Kowitlawakul et al. (2014)
Spain	Fernández-Alemán et al. (2014)
Sultanate of Oman	D'Souza et al. (2014)
Taiwan	Yu et al. (2013)

2.3.2 Study design

The most frequent study designs were quantitative (n=19), with sixteen qualitative studies and three mixed methods studies.

2.3.3 Level of evidence

The National Health and Medical Research Council level of evidence for the studies was either III-3 (comparative without concurrent controls) or IV (case series with either post-test or pre-test/post-test outcomes). Most of the quantitative studies used different tools for data collection, making direct comparison impractical, with the exception of Robinia and Anderson

(2010), Richter and Idleman (2017) and Hampton et al. (2020), who all utilised the Michigan Nurse Educator's Sense of Efficacy of Online Teaching (MNESEOT). Internal reliability (Cronbach's alpha) was reported by 13 studies (Abell & Garrett-Wright, 2014; Ali et al., 2017; Burke & Ellis, 2016; D'Souza et al., 2014; Fernández-Alemán et al., 2014; Gonen & Lev-Ari, 2016; Hampton et al., 2020; Howe et al., 2018; Richter & Idleman, 2017; Roney et al., 2017; Tacy et al., 2016; Tzitzolaki et al., 2014; Yu et al., 2013), eight studies used previously validated surveys (Abell & Garrett-Wright, 2014; Ali et al., 2017; Broussard & Wilson, 2018; Burke & Ellis, 2016; Hampton et al., 2020; Kotcherlakota et al., 2017; Richter & Idleman, 2017; Robinia & Anderson, 2010) and seven studies incorporated expert review for validation of the tools used (Buxton et al., 2015; D'Souza et al., 2014; Howe et al., 2018; Nguyen et al., 2011; Roney et al., 2017; Tacy et al., 2016; Yu et al., 2013). However, only two studies reported a power analysis to determine sample size (D'Souza et al., 2014; Howe et al., 2018).

2.3.1 Data abstraction and synthesis

Studies retained for thematic review covered nurse academics and technology in a broad sense (for example, using surveys focussed on technological self-efficacy) and more specific technologies (such as use of iPads). Although the current study focussed on technology in a broad sense, the inclusion of specific technology studies allowed the researcher to consider if the issues found at a broad level were consistent at a more specific level. The use of thematic analysis allowed for comparison between the more broad and specific literature and was undertaken using an adaptation of the six step thematic coding process suggested by Braun and Clarke (2006) to identify, select, differentiate and dissect recurring themes. The steps included: 1) familiarisation with the studies by reading and rereading the published articles, 2) identification of key findings in each study and applying initial codes to those findings, 3) comparison and consolidation of the codes (for example time, time-consuming, workload became one code), 4) the collection of similar codes into potential themes.

Potential themes were reviewed against the entire data set and nodes were created in NVivo© to identify which themes originated from which studies. Refining of the themes followed, in which the researcher decided which names clearly defined each theme and what separated them from each other to reduce overlaps (Braun & Clarke, 2006).

2.4 Themes Identified from the Literature

Following analysis of the reviewed studies, seven themes were identified. No single theme was found across all articles, although attitudes and support/training were common in 22 and 29 of the sources respectively. The themes and their empirical sources are detailed in Table 2.2 and are: *Academics' attitudes towards technology*, *Training and support for teaching with technology, Knowledge of technology*, *The impacts of technology on academics' time*, *Academic demographic influences on technology use*, *Academic concerns for technology and nursing students*, and *Nursing pedagogy and technology in teaching*.

Table 2.2 – Summary of themes and their sources

Theme	Source	Count
Academics' attitudes towards technology	Alves et al., 2020; Broussard & Wilson, 2018; Burke & Ellis, 2016; Buxton, Buxton, & Jackson, 2015; D'souza, Karkada, & Castro, 2014; Fernández-Alemán et al., 2014; Freed, Bertram, & McLaughlin, 2014; Gonen & Lev-Ari, 2016; Hampton et al., 2020; Howe, Chen, Heitner, & Morgan, 2018; Jokinen & Mikkonen, 2013; Jones, Garrity, VanderZwan, Epstein, & Burla de la Rocha, 2016; Kotcherlakota, Kupzyk, & Rejda, 2017; Kowitlawakul, Chan, Wang, & Wang, 2014; Moule, Ward, & Lockyer, 2010; Nabolsi et al., 2021; Nsouli and Vlachopoulos, 2021; Petit dit Dariel, Wharrad, & Windle, 2013, 2014; Richter & Idleman, 2017; Robinia & Anderson, 2010; Sinacori, 2020; Sweeney et al., 2016; Sword, 2012	24
Training and support for teaching with technology	Abell & Garrett-Wright, 2014; Allan, O'Driscoll, Simpson, & Shawe, 2012; Alves et al., 2020; Broussard & Wilson, 2018; Burke & Ellis, 2016; Buxton et al., 2015; D'souza et al., 2014; Fernández-Alemán et al., 2014; Freed et al., 2014; Gazza, 2017; Hampton et al., 2020; Howe et al., 2018; Jones et al., 2016; Kotcherlakota et al., 2017; Kowitlawakul et al., 2014; Moule et al., 2010; Nabolsi et al., 2021; Nsouli and Vlachopoulos, 2021; Nguyen, Zierler, & Nguyen, 2010; Petit dit Dariel et al., 2013, 2014; Porter et al., 2020; Richter & Idleman, 2017; Robinia & Anderson, 2010; Roney, Westrick, Acri, Aronson, & Rebeschi, 2017; Sinacori, 2020; Stec, Smith, & Jacox, 2020; Sweeney et al., 2016; Sword, 2012; Tzitzolaki, Tsiligiri, & Kostouda, 2014; Wingo, Peters, Ivankova, & Gurley, 2016	31
Knowledge of technology	Alves et al., 2020; Freed et al., 2014; Gazza, 2017; Jones et al., 2016; Moule et al., 2010; Nabolsi et al., 2021; Nsouli and Vlachopoulos, 2021; Richter & Idleman, 2017; Robinia & Anderson, 2010; Sinacori, 2020; Sweeney et al., 2016; Sword, 2012; Tzitzolaki et al., 2014	12
The impact of technology on academic's time	Allan et al., 2012; Buxton et al., 2015; D'souza et al., 2014; Fernández-Alemán et al., 2014; Gazza, 2017; Hampton et al., 2020; Jones et al., 2016; Kowitlawakul et al., 2014; Moule et al., 2010; Nabolsi et al., 2021; Petit dit Dariel et al., 2013, 2014; Porter et al., 2020; Richter & Idleman, 2017; Robinia & Anderson, 2010; Sweeney et al., 2016; Sword, 2012; Tzitzolaki et al., 2014; Wingo et al., 2016	20
Academic demographic influences on technology use	Abell & Garrett-Wright, 2014; Ali, Ali, & Jones, 2017; Broussard & Wilson, 2018; Buxton et al., 2015; Fernández-Alemán et al., 2014; Gonen & Lev-Ari, 2016; Hampton et al., 2020; Howe et al., 2018; Kotcherlakota et al., 2017; Kowitlawakul et al., 2014; Nguyen et al., 2010; Richter & Idleman, 2017; Robinia & Anderson, 2010; Roney et al., 2017; Tzitzolaki et al., 2014; Yu, Wang, & Lin, 2013	16
Academic concerns for technology and nursing students	Allan et al., 2012; Alves et al., 2020; Burke & Ellis, 2016; D'souza et al., 2014; Gazza, 2017; Jokinen & Mikkonen, 2013; Jones et al., 2016; Moule et al., 2010; Nabolsi et al., 2021; Nsouli and Vlachopoulos, 2021; Porter et al., 2020; Sinacori, 2020; Stec et al., 2020; Sweeney et al., 2016	15
Nursing pedagogy and technology in teaching	Broussard & Wilson, 2018; D'souza et al., 2014; Freed et al., 2014; Gazza, 2017; Hampton et al., 2020; Jones et al., 2016; Nabolsi et al., 2021; Petit dit Dariel et al., 2013; Porter et al., 2020; Smith & Crowe, 2016; Stec et al., 2020; Sweeney et al., 2016; Sword, 2012; Wingo et al., 2016	15

2.4.1 Academics' attitudes towards technology

Academics' attitudes to technology in teaching were explored in much of the literature, with 24 studies addressing this (see Table 2.2). The theme incorporates positive and negative attitudes and their impacts. However, the interaction of positive and negative attitudes on technology use was less apparent.

Several studies noted that nurse academics generally felt positive about technology, reporting satisfaction with online teaching (Howe et al., 2018), positive feelings and attitudes to online teaching (Broussard & Wilson, 2018) and pride in creating blended learning programs that assisted students (Sweeney et al., 2016). In a study of Technology self-efficacy based in the state of Georgia (USA), self-efficacy was noted to be high among nursing faculty familiar with online teaching, using the MNESEOT scale (Richter & Idleman, 2017). The findings indicate experience with technology increases sense of efficacy, although the scale was based on capabilities rather than internal attitude to technology. The study also had a small sample size despite surveying 12 institutes and some respondents did not meet the inclusion criteria. A survey of nurse academics' IT use and work climate based in Israel, found that there were positive correlations between self-efficacy, innovativeness, attitudes to IT and intention to use IT (Gonen & Lev-Ari, 2016). These researchers concluded that higher innovativeness and more positive attitudes increased the participant's sense of efficacy, which in turn, increased their intention to use technology in teaching. Although the study focussed on work climate, it measured self-reported use of technology rather than intent to use technology, preventing the issue of intention-use gap (Liu et al., 2019). The study was conducted across 10 institutes but had a small sample of 109 participants. Petit dit Dariel et al. (2013), in a study of factors influencing elearning adoption, found that nurse academics who noted the potential for technology to improve their teaching, were aware of the evidence that supported elearning, and were more likely to have positive attitudes to technology in their teaching. The study used Q-methodology to sort

study participants into four groups based on their views of technology. The groups were: ; Advocates, who thought elearning could transform nursing, Humanists, who thought elearning hinders interpersonal skill development, Sceptics, who found elearning frustrating and thought elearning did not develop clinically competent nurses, and Pragmatist, who used elearning to reinforce what was taught in class but were ambivalent to the impact of elearning.

A mixed methods study of nurse academics attitudes to elearning based in Lebanon reported three categories of faculty; 'pioneers' who had positive attitudes to technology, 'followers' who had neutral attitudes and 'resisters' who had negative attitudes (Nsouli & Vlachopoulos, 2021). A study of nurse academics' experiences of transition to a blended learning based in Finland, reported finding participants felt positive towards undergraduate blended learning but participants noted that blended learning was challenging in terms of planning and design (Jokinen & Mikkonen, 2013). The participants from this study were narrowly defined (one site and only those who had taught into the first year of the blended program) and the authors, who were part of the faculty, which may have induced bias. However, other studies confirmed that using technologies in teaching was a challenge, particularly because teaching with technology required a cultural shift in terms of pedagogy to fully engage with the technology (Sinacori, 2020; Sweeney et al., 2016). This indicates that even those academics who have positive attitudes to technology in teaching are aware of the challenges therein.

Not all studies that considered attitudes to technology were positive, with five noting negative attitudes of academics towards technology in teaching. Anxiety about technology was common, with nurse educators in the state of Louisiana (USA) reportedly experiencing mild to moderate technological stress on the Nurse Educator Technostress Scale (NETS) when implementing digital health records in clinical courses (Burke & Ellis, 2016), whilst nurse academics based at a single site in the state of Missouri (USA) expressed feelings of anxiety, worry and self-doubt when using new lecture capture technology (Freed et al., 2014). Technology use was also reported as frustrating, challenging and overwhelming by

nurse academics in a study based in the United Kingdom (Moule et al., 2010) and nurse academics from seven institutes in the state of Missouri (USA), described technology as intimidating as they transition to online teaching (Sword, 2012). However, both studies are now considerably dated, as attitudes and technology may have changed over the last decade. In an Irish study relating to the transition to blended learning, nurse academics who had recently transitioned to blended learning approaches described the process negatively and that it caused some anxiety, indicated a need for training to address their apprehension (Sweeney et al., 2016). Despite the small sample size, all members of the population participated, indicating participants were motivated to have their voices heard. However, Moule et al. (2010) found that some nurse academics raised their reluctance to engage with technology, despite support, preferring to leave the development of elearning to “others”. This indicates that training alone may not be enough to encourage engagement with technology. However, given the age of the study, this attitude may have shifted over time. Sword (2012) proposed that associations with technology was seen as a loss, that is, academics reported grieving the loss of familiar and usual ways in which they previously taught. Further, a study based in the state of Nebraska (USA), of nurse academic experience in relation to technology use, found that nurse academics who were new to the role were more likely to have positive attitudes and motivation for technology use and adoption, than experienced nurse academics (Kotcherlakota et al., 2017). Although a longitudinal study, Kotcherlakota et al. (2017) compared independent samples across 2014 and 2015, reducing the ability of the study to detect individual changes across time. As nurse academics new to the role have no frame of reference for prior ways of teaching, they may not be as impacted by the sense of loss of traditional ways of teaching.

Overall, the evidence presented above suggests that positive attitudes to technology are associated with academic engagement with technology in teaching. While nurse academics noted the ability of technology to improve their teaching, they were aware of challenges and issues associated with technology use (Petit dit Dariel et al., 2013; Sinacori, 2020). These

challenges may have influenced the participants who held negative attitudes to technology (Moule et al., 2010; Sweeney et al., 2016). Sword (2012) reported that academics felt frustrated and struggled with teaching online but continued to invest time and effort to be successful in changed teaching formats, suggesting that despite their negative feelings, they would persevere with technology in teaching. Further investigation of the interaction of positive and negative attitudes to technology may reveal how to increase positive attitudes to technology and the underlying causes of why these attitudes are held.

2.4.2 Training and support for teaching with technology

Training and support appears to be self-explanatory as a theme, however, the literature suggests it is quite nuanced. This was the most common theme, being present in 31 studies (see Table 2.2), indicating its importance. Aspects of training and support that emerged included a high need for training in technology, effect of training, peer support and technical support.

The need for technology training was identified by several studies (Broussard & Wilson, 2018; Burke & Ellis, 2016; Robinia & Anderson, 2010). A study of nurse academics' online teaching efficacy based in the state of Michigan (USA), reported findings that self-efficacy in relation to online teaching was impacted by whether they had training in the online teaching (Robinia & Anderson, 2010). The study focussed on self-efficacy, rather than attitude, but was conducted at multiple sites but in one state only. Similarly, in a study of nurse academics' attitudes to online teaching, researchers found that nurse academics who had limited training in the features of the learning management system (LMS) engaged in limited use of the LMS and hesitancy to try new features, compared to those who had more extensive training (Broussard & Wilson, 2018). The study had a relatively small sample size (n=58) reducing generalisability of the findings; however, it was conducted across three institutes. The survey used, lacked reliability and validity testing and inferential statistical analysis using descriptive analysis, reducing the rigor of the findings. Richter and Idleman

(2017) found that nursing faculty who had taken a seminar on online teaching had higher efficacy scores in student engagement, instructional strategies, computer use and overall online efficacy. However, the sample size of 59 was low, reducing generalisability of the findings. In a study considering eBook use and stage of concern (SoC) based in the state of Kentucky (USA), the findings indicated that nurse academics who had received some formal training in eBook use were more likely to use eBooks in their courses (Abell & Garrett-Wright, 2014). SoC is used to determine the seven stages of concern individuals go through, during the change process (Hall & Hord, 2006). The study was focussed on a very specific teaching technology (eBooks), reducing the potential application of the findings to broader technology use. In another study of nurse academics need for training in the use of technologies, based in the WWAMI region (Washington state, Wyoming, Alaska, Montana, and Idaho in the United States of America), researchers found greater availability of distance learning training and support for nurse academics was associated with greater use of technology for distance learning (Nguyen et al., 2011). However, the researchers did not report reliability testing on the survey. Finally, in a study of technology use and the factors that influenced technology use based in a single institute in Greece, researchers found that nurse academics who indicated they had received some training (a program or seminar on the integration of the ICT tools in teaching) utilised technology In their teaching more frequently than those with no training (Tzitzolaki et al., 2014). The study lacked validity testing of the survey tool and focussed highly on technology use, but not attitude to technology. Overall, the effect of training appears to be associated with the academics' abilities to engage and use technology in their teaching.

Peer support was also identified as an aspect of informal training that enabled academics to better engage with technology. Nurse academics reported informal support groups provided opportunities for them to share creative adaptations using technology in teaching (Freed et al., 2014). Sweeney et al. (2016) found that sharing of resources was not only important for collegial support, it also led to a time-sparing affect as other academics could utilise

innovations identified by their peers rather than the time-consuming process of identifying and trialling technology themselves. More formal peer support, such as mentoring, was also found to have beneficial effects, increasing nurse academics' satisfaction with teaching (Howe et al., 2018) and allowing them to feel supported, particularly if this was the first time they had used online technologies (Sinacori, 2020). Peer support, both informal and formal, demonstrates benefits to academics and their engagement with technology in teaching.

In addition to peer support, technical support from dedicated IT professionals or learning designers was seen to be essential for successful use of technology. Moule et al. (2010) noted that to enable elearning, technical support for nurse academics was seen as vital and nurse academics expressed reluctance to engage with technology if support was not available. An Australian study confirmed this, with nurse academic participants who implemented combined blended and online program deeming technical support as essential (Porter et al., 2020). Although this study focussed on implementation of the blended and online program, rather than technology itself, the program relied on technologies to transition into a blended and online program. Finally, 90% of respondents in a study by Nguyen et al. (2011) indicated that technical support would be needed for them to use technologies in teaching. Of note, research conducted by Tzitzolaki et al. (2014) considered factors that influenced technology use and found that by increasing technical support, the nurse academic's use of ICT increased in the educational setting, indicating a direct link between technical support and technology use. These studies demonstrate the impact technical support can have on technology use in teaching. Confirming the above, Sword (2012) found that lack of technical support effected nurse academics, who had transitioned to online teaching, by creating disillusion in technology in teaching. Additionally, a cross-sectional study in the United States of self-efficacy and satisfaction of online teaching of nurse academics reported a lack of institutional support reduced satisfaction with teaching online (Hampton et al., 2020). These studies further indicate the direct relationship between technical support and successful academic engagement with technology in teaching.

An interesting caveat in relation to technology support was that academics reportedly preferred local technology support. Richter and Idleman (2017) found nurse academics with access to a local instructional designer viewed this access as invaluable over centralised support for creating online instruction. Robinia and Anderson (2010), utilising the same survey, found participants who had experience teaching online felt meeting with an instructional support expert was the most valuable preparatory experience.

Despite utilising training or training being available, several studies noted that nurse academics felt that they required additional training. Nguyen et al. (2010) found despite training and technical support, many participants felt a need for additional training in distance education programs. However, the study is focussed on distance education which may narrow the applications. A study of technology use and technological self-efficacy of nurse academics from across the United States had a similar finding, that despite meeting with a technology support person, nurse academics stated much of what they learnt was on their own (Roney et al., 2017). Nsouli and Vlachopoulos (2021) reported participants felt they required additional training as students were more advanced than them in technical skills. Several authors suggest reasons for this. Petit dit Dariel et al. (2014) reported that academics and institutes defined support differently; with institutes defining support as the infrastructure, equipment and training, while academics defined support as incentives and recognition of time taken to engage with technology. However in a multiple-case design study on the benefits and challenges of teaching nursing online based in the state of Alabama (USA), researchers found nurse academics stated that training sessions were not held at convenient times and they felt training sessions were a “one size fits all” rather than addressing their individual needs (Wingo et al., 2016). This is further supported by a qualitative study of nurse academics’ perceptions of iPad integration into the nursing curriculum in the state of Ohio (USA), where the researchers suggested a tiered approach to learning, from basic to more advanced, allowed for better use of technology in teaching (Stec et al., 2020). Finally, a Brazilian grounded theory study of technology use by nurse

academics in teaching suggested that there must be a synergy between content knowledge, pedagogical training for using technology and technology resources, in order for ICT to be successfully integrated (Alves et al., 2020). Therefore, studies suggest that supporting academics through training requires thoughtful consideration of the unique needs of the academics rather than a one size fits all approach.

Training and support have been shown to be an essential part of the academic fully engaging with technology in their teaching. Training and support not only comprise formal training, but also technical and peer support that allows the academic access to fully utilise technology in their teaching. Training and support need to be flexible to meet the needs of the academic, rather than generalised training.

2.4.3 Knowledge of technology

Using technology in teaching requires understanding and knowledge of both the technology itself, and how best to use it in a teaching setting. The studies in this literature review demonstrated that nurse academics expressed a need to understand the technology for their teaching. Knowledge is more encompassing than training as it requires the academic to know what technology to use and when to use it, not just how to use it.

Several studies noted that developing knowledge of the technology to be used was essential for nurse academics to fully engage. In a qualitative inquiry study of the transition from traditional to online teaching, based in the state of New Jersey (USA), researchers found that nurse academics felt they lacked knowledge about technology and online pedagogy, identifying that training and professional development was required to allow them to address this (Sinacori, 2020). However, the data analysis and qualitative rigour was not clearly reported, meaning the reliability of the findings cannot be ascertained. Sweeney et al. (2016) found nurse academics' lack of knowledge of approaches to elearning led to a lack of confidence in using technology during transition to a blended learning nursing program. Moule et al. (2010) found that lack of technology knowledge and skills would prevent nurse

academics from developing interactive learning materials. Although the study lacked survey reliability testing, the thematic analysis was well described. Robinia and Anderson (2010) found that nurse academics with experiential knowledge (defined as having taught online previously) had higher online efficacy than those with no experiential knowledge. These studies indicate that lack of knowledge and familiarity with technology prevents academics from fully utilising technology in their teaching.

Several studies also noted that technology knowledge development was demanding. In one study of nurse academics' attitudes to blogging as a teaching tool, based in the state of Illinois and province of Ontario (USA and Canada respectively), researchers reported that using blogging as a teaching tool forced a steep learning curve on nurse academics and they were concerned about using technology without having first mastered the technology (Jones et al., 2016). However, blogging is a very specific technology and the findings may not relate to technology more broadly. Richter and Idleman (2017) reported findings that nurse academics expressed learning to use technology was challenging and that the technologies frequently changed, rendering some knowledge obsolete. Sword (2012) found nurse academics felt the amount of knowledge of technology required during transition to online teaching was overwhelming. Tzitzolaki et al. (2014) found ICT tools identified as easier to use (such as search engines, word, email) had more frequent use by nurse academics than those identified as difficult to use (such as forums, videoconference systems). This is likely due to the increase of knowledge required to use ICT tools seen as difficult. These studies indicate that knowledge of technology is a factor in engagement with technology and acquiring this knowledge is important for engagement with technology.

The literature demonstrates that academics need to develop knowledge of teaching technologies and how to use them. The theme has demonstrated that knowledge is associated with engagement with technology. As new teaching technologies continue to develop, the development of knowledge of such technologies will likely be an ongoing process.

2.4.4 The impacts of technology on academics' time

This theme identifies the ways in which technology has an impact on an academic's time, including time to learn technology, time to implement technology, increase in academic workload, time to maintain technology and time to support users (students). Time was a consideration for many academics within the included studies and emerged as a theme in 20 studies (see Table 2.2). The dominant concern of academics was that engaging with technology was seen as time consuming.

Many of the studies noted that academics viewed technology as time consuming. Jones et al. (2016) reported findings that nurse academics, who were exploring blogging as a learning tool, felt there was a significant time commitment to setting up, running and maintaining new technology associated with blogging in the class. In a United States phenomenology study of the experience of nurse academics teaching online, researchers found nurse academics who taught both online and face-to-face, felt teaching online took much more time than the equivalent teaching face-to-face (Gazza, 2017), although it was unclear why or where the additional time came from (such as preparation, management or review). Porter et al. (2020) reported findings that participants lacked time to prepare and implement technology in their teaching when implementing a new blended learning program, despite being given similar timeframes as prior traditional teaching. Findings from a study of the impact of COVID-19 lockdowns on nursing faculty in Jordan, reported participants spent twice as much time on online learning as compared to traditional teaching (Nabolsi et al., 2021). All studies that discussed time as a barrier to engaging with technology suggest more time was needed in order to engage with technology.

Much of the time required to engage with technology was described as being "hidden" (Jones et al., 2016; Moule et al., 2010; Wingo et al., 2016). The increased time technology required was not necessarily within direct teaching, but rather, increased time in preparation, maintenance, review and support. The increased time commitment of technology was

further supported by studies that found academics viewed technology as increasing their workloads (D'Souza et al., 2014; Gazza, 2017; Hampton et al., 2020; Richter & Idleman, 2017; Wingo et al., 2016). Petit dit Dariel et al. (2014) found that a lack of official recognition within workloads created tension, as nurse academics had to consider where they would allocate their time. This meant that engaging with technology came at the expense of using time for other pursuits (such as research). Alternatively, Tzitzolaki et al. (2014) found nurse academics who reported being allocated time to engage with ICT demonstrated increased use of ICT tools in the education setting. This indicates that lack of time is a real concern, which could be mitigated by recognising the time taken to engage with technology in teaching and allocating time in academic workloads. How much additional time this requires is unclear.

Some researchers found a contrast between need for time for technology against the assumption that using technology would save time. Sword (2012) found nurse academics who had transitioned to online teaching assumed online teaching would save time, but reported it was more time-consuming than traditional teaching. In similar findings, both Porter et al. (2020) and D'Souza et al. (2014) found that nurse academics expressed a need for increased time to design and develop blended learning for undergraduate nursing courses compared to traditional courses. This may be due to nurse academics being more familiar with traditional ways of teaching or the increased time to develop may be an inherent quality of using technology in teaching.

The above studies indicate that engaging with technology requires increased time commitments from academics. The perceived lack of institutional recognition of this requirement leaves academics in the unenviable position of balancing increasing technology use against traditional academic goals (such as research).

2.4.5 Academic demographic influence on technology use

The effect of demographic profiles on teaching technology was reviewed by several studies. Three aspects were most reported across the studies: experience, age and gender. The impact that each demographic aspect reportedly had on technology in teaching is discussed below.

The experience of the academic generally refers to either the number of years teaching, seniority, or experience with technology (such as previous experience teaching online). Experience was reported as having both positive and negative effects on teaching with technology. However, the literature overall demonstrated that experience had little impact. Positive effects of experience included: a study of emotional intelligence and online teaching efficacy based across the United States, where researchers found greater overall teaching experience (both traditional and online) correlated to greater online teaching efficacy (Ali et al., 2017). Additionally, Gonen and Lev-Ari (2016) reported finding academic seniority positively predicted innovativeness and, a study of nurse academic satisfaction with teaching online, reported findings that nurse academics from across the United States who had taught significantly more online (20 or more courses) had higher satisfaction with their teaching online than nurse academics who had less experience (five or less courses) (Howe et al., 2018). However, there were negative findings as well. Kotcherlakota et al. (2017) reported a negative relationship between years of experience and attitude towards obtaining increased skills for technology integration, whilst Roney et al. (2017) reported a similar finding with increasing years of teaching experience associated with lower levels of technology self-efficacy. Reasons for the impact of seniority on technology use are unclear; however, the impact of academic position should be considered in future research.

Several studies found nurse academics' experience had no effect on technology in teaching: nurse academics' years of experience in a HEI had no impact on their use of eBooks (Abell & Garrett-Wright, 2014), while another study reported finding participant age and seniority did not predict actual use of technology (Gonen & Lev-Ari, 2016). Further, Richter and Idleman (2017) demonstrated no correlation between online teaching efficacy survey scores

and experience, faculty rank or degree held (masters or doctorate). Additionally, Hampton et al. (2020) reported finding no difference in the online teaching satisfaction scores due to years of face-to-face teaching experience. Overall, the findings for experience indicate that, although having experience with particular technologies (such as online experience) increases the academic's use of that technology, general technology use is not predicted by general teaching experience. Academic rank or seniority also appear to not be associated with technology use in teaching.

The age of academics was considered in several studies to determine if this had an impact on attitude or use of technology in teaching. In a study of nurse academic technology use in higher education institutes in Spain, researchers found a negative correlation between age and the number of technology devices used in teaching (Fernández-Alemán et al., 2014). However, the focus of the study was on social media use, which may not include other technologies used by participants. However, Roney et al. (2017) reported a weak, positive correlation ($r = .127$, $p < .05$) between nurse academics' age and technology self-efficacy. Several studies found age had no effect on teaching with technology, that is, age was not associated with frequency of distance learning tool use (Nguyen et al., 2010). There were no correlations between survey results for online teaching efficacy and age (Richter & Idleman, 2017) and no correlation between MNESEOT scores and age (Robinia & Anderson, 2010). Given the weak correlations of studies finding a difference between age and technology, and the number of studies that found no difference, it is likely that age is not a good predictor of teaching with technology.

Few studies considered gender as a demographic factor that influenced attitudes and technology use. Similar to age, most studies found that gender was not a significant factor. Robinia and Anderson (2010) reported no significant difference between males and females on the MNESEOT scores, indicating that gender does not appear to affect perceived abilities for teaching online. Roney et al. (2017) found no significant relationship between gender and technology use was identified and Tzitzolaki et al. (2014) found gender of nurse academics

was not associated with the use of ICT tools in the undergraduate education setting. These studies demonstrate that gender appears to play no significant role in attitudes or use of technology in teaching. However, many of the studies were gender biased due to the nature of nursing academia (predominately female gendered), meaning the homogenous nature of the participants may have prevented detection of statistically significant differences. Overall, the effect of the demographics (experience, age and gender) appears to have little influence on the academic's use of technology in teaching. The assumption that age or gender impact technology is not supported by the evidence.

2.4.6 Academic concerns for technology and nursing students

This theme describes concerns and issues raised in the literature by nurse academics in relation to the students they taught. A commonly held belief is that students are "digital natives", assumed to be adept in technology, having grown up in an age saturated in digital technology (Allan et al., 2012). Fifteen studies referred to students and technology, in both positive and negative ways (See Table 2.2). The most telling aspect from these is that the "digital native" moniker assumes a homogenous student cohort in terms of age, access to technology and technology skill. Many of the studies demonstrated that this assumption is incorrect. This theme, therefore, incorporates the findings from participants that expressed concern about student digital literacy, the student drive for technology use, and factors that academics considered impacted student technology use. The discussion is from the point of view of nurse academics rather than the nursing students themselves, which accounts for the lack of nuance in the reported findings.

Many studies noted that students were not as digitally literate as academics assumed. In a study of academic views of elearning of non-traditional students in higher education based in the United Kingdom (non-traditional defined by class, background and ethnicity), it reported that nurse academics overestimated the computer skills of their students and, therefore, their comfort level with elearning (Allan et al., 2012). Further, in a study by Moule et al. (2010),

nurse academics expressed a belief that poor IT literacy of students was a barrier to using technology in teaching, while in a United States study of integrating iPads into the curriculum, researchers found academics reported nursing students required training to fully utilise the technology (Stec et al., 2020). In a study of blended learning implementation of an undergraduate nursing program based in Finland, researchers found nurse academics were disappointed by the lack of student knowledge of online material (Jokinen & Mikkonen, 2013). Jones et al. (2016) found nurse academics reported students from their courses were not happy about increased use of computers, showing preference for more traditional, face-to-face teaching. The above studies show there should not be an assumption that students will accept and be knowledgeable in teaching technologies, particularly in nursing student cohorts. Interestingly, some participants in two studies believed that appealing to nursing students was the driving force behind increasing technology use (D'Souza et al., 2014; Moule et al., 2010), which contradicts the above discussion of nurse academic concern regarding students' technology abilities. A major limitation of all the above studies is that they are indirect measures of students' ability with technology, as this was an academic opinion of the student ability. Nevertheless, nurse academics appear to be cognisant of their student's technology abilities which may influence their attitudes and use of technology.

Another consideration raised by two studies relates to student access to technology. Jones et al. (2016) reported that participants were concerned over the ability of students to access the technology that enabled blogging, particularly disadvantaged students. Sweeney et al. (2016) noted participant concern over students' access to technology, particularly the effect of those students who did not have access to high speed internet. Participants from both studies noted that students who would have issues with access were likely already from disadvantaged backgrounds and technology use may put them at a further disadvantage. However, Porter et al. (2020) found participants expressed the opinion that technology may open education to student cohorts that would be unable to access it otherwise, such as those isolated by geographical distance or work/family responsibilities. This creates a

dilemma, as technology may increase access to education for some students, while inhibiting others.

The findings discussed above suggest that assumptions of student technology ability, in relation to digital literacy or illiteracy, may be incorrect. This is important for nurse academics, as they design courses utilising technology in their teaching. They must be cognisant of the technology user (students), ensuring that the technology itself is not an impediment to learning.

2.4.7 Nursing pedagogy and technology in teaching

The impact of technology on teaching is particularly relevant for nursing discipline for two reasons, namely the potential for public harm if teaching is performed poorly, and the emphasis placed by the profession on communication and interpersonal skills (Bhana, 2014). Hence, the effect of technology of pedagogy is something that academics in several included studies raised as a concern. The findings from the studies below demonstrate that nurse academics were aware that technology would have an impact on what, how and when teaching occurs, but they were cautious as to whether this would benefit students. The literature explores the nurse academic view of the impact of technology on pedagogy, both positive and negative. In addition, the particular impact on nursing skills is discussed.

Nurse academics, in several studies, considered how technology had impacted their teaching. Technology was seen to increase the abilities of students to revise and repeat material via recorded sessions (Freed et al., 2014), allowed back and forth interaction online between both academic-to-student and student-to-student (D'Souza et al., 2014; Gazza, 2017) and the ability to increase social interaction between nursing academics and distance students (students located off campus), who were taught by using online technologies (Petit dit Dariel et al., 2013). Engagement was another aspect of pedagogy discussed. Porter et al. (2020) found participants viewed student engagement as underpinning the success of

blended learning, whilst a study of the perceptions of nurse academics who had taught online across the United States, reported student engagement via technology as essential for students (Smith & Crowe, 2016). Additionally, Wingo et al. (2016) found technology allowed nurse academics to create multiple ways to engage students. In the above studies, technology was seen to have a positive impact on teaching and student engagement. However, academics felt responsibilities in teaching nursing students. Sword (2012) reported findings that participants engaged in self-questioning around the appropriate delivery of course content to students. While Petit dit Dariel et al. (2013) found nurse academics felt responsibility for teaching online due to the potential harm students can cause to patients if taught incorrectly. This was compared to a history class where incorrect information may be inconvenient or problematic but did not risk public safety, whereas improper teaching of nursing skills may endanger vulnerable persons (Petit dit Dariel et al., 2013). This concern was echoed by Sword (2012), where nurse academics expressed concern that essential course content might not be covered using technology in an online teaching setting. This uncertainty may prevent academics from exploring technology if there is a risk that "essential" information may be missed or misinterpreted by students.

Nurse academics also reportedly felt that technology should not unduly influence pedagogy. Jones et al. (2016, p. 687) reported nurse academics concerns that technology, in this case blogging, was driving pedagogy " … technology may drive the learning instead of the learning driving the technology". Petit dit Dariel et al. (2013) summarised that lack of adoption of elearning was not a reactive response of resistance, but rather, a considered response to pedagogical needs and perceived lack of added value in using technology from the nurse academic perspective.

Interpersonal and communication skills development was also reported to be of concern to nurse academics. This included concern that technology may not be able to develop nursing skills considered necessary for the profession. Jones et al. (2016) found that nurse academics felt online learning was a deterrent to the role-modelling aspect of nursing, by creating distance in the professional-learner relationship. Sweeney et al. (2016) reported

nurse academics were concerned that the interpersonal relationship of traditional face-to-face teaching would be lost if technology was used in the delivery of teaching, suggesting this would impact the students' interpersonal skills development. Participants in Nabolsi et al. (2021) reported concerns that communication, clinical and professional skills, were adversely impacted by online teaching. Findings from Petit dit Dariel et al. (2013) indicated some participants believed that elearning may cause the essence of nursing to be lost; that elearning could not replace 'in person' communication skills development and that nursing students needed hands-on experience to learn their profession. Nurse academics, having practised in the profession, are aware of the importance of interpersonal skills. Their concerns that technology may not meet the needs of the student to become a proficient nurse require further exploration.

Overall, the literature indicates that nurse academics had very balanced views of the impact technology had on their teaching. Although they were aware of the positive and beneficial aspects of technology, they were keenly aware that technology may not meet all their requirements for teaching the profession of nursing. Interpersonal skills were seen as essential to the profession, and academics raised concerns of the impact teaching with technology would have on those skills. As such, academics appear cautious in their use of technology, in order that the technology adds value to their teaching. There is an apparent gap in the literature pertaining to the nurse academic and their direct attitude to technology. Many of the studies above measured attitude either indirectly or as a function of another aspect of technology, such as technology efficacy. Many of the studies in this review also lacked a national approach, with some limited to a single institute, which created a hinderance to generalisable findings outside of the study settings. The recency of the literature is also of concern in some areas, as over fifteen of the studies occurred prior to 2015, which may impact the types and features of technology available at the time. There was only one Australian study, with most studies conducted in the United States. Finally, the focus on technology as a broad theme, rather than a specific technology, is lacking in the

literature, which does not allow for discussion of the nurse academic attitude to technology in general.

2.5 Strengths and Limitations of the Studies

While each study had weaknesses and a lack of similarity between research approaches and data collection tools, there were similar conclusions. However, there were limitations that were common across the studies, for example, small sample sizes of less than 100 participants were seen in seven studies that utilised quantitative methods including: Broussard and Wilson (2018) *n*= 58, Richter and Idleman (2017) *n*= 59, Burke and Ellis (2016) *n*= 64, Buxton et al. (2015) *n*= 12, Abell and Garrett-Wright (2014) *n*= 50, D'Souza et al. (2014) *n*= 50 and Tzitzolaki et al. (2014) *n*= 90. This reduces the reliability and generalisability (VanVoorhis & Morgan, 2007). Similar issues were identified in five studies which were conducted at single sites (Abell & Garrett-Wright, 2014; Buxton et al., 2015; D'Souza et al., 2014; Kotcherlakota et al., 2017; Yu et al., 2013). While not inherently wrong, the issue lies in the ability to generalise, as findings may be particular to that site due to confounding factors, reducing the ability to make broader claims from the findings. Sampling bias was also present in two studies. In a study of technology use and technological self-efficacy of nurse academics, sampling favoured schools with multiple campuses as the sample allowed for more participants from these institutes (Roney et al., 2017) and a study of e-book use of nurse educators sampled participants from a single state nursing conference (Abell & Garrett-Wright, 2014). Both sampling methods may have introduced a bias in the types of participants represented in their sample as not necessarily reflecting the target population. Four studies lacked reliability testing (particularly Cronbach Alpha reporting) of their data collection tools: Broussard and Wilson (2018); Buxton et al. (2015); Kotcherlakota et al. (2017); Nguyen et al. (2011). Reliability testing is important as it demonstrates a tool is internally consistent (reliable) and measures the degree to which the individual items in a scale are correlated with each other and the total scale score

(Liamputtong & SpringerLink, 2019). This means that the results may not be repeatable and may lack consistency. An important aspect of the previous studies was the focus of each study in terms of the research aim of this thesis. Nine studies measured either attitude indirectly or an attitude-like construct, such as self-efficacy. Efficacy is defined as “sense of certainty in one’s abilities to execute a given behaviour to achieve a predetermined outcome” (Hampton et al., 2020, p. 303), and is commonly correlated and reported alongside attitude (Brown, 2016). However, it is still not a direct measure of attitude. Five studies focussed on efficacy related to technology: Ali et al. (2017); Hampton et al. (2020); Richter and Idleman (2017); Robinia and Anderson (2010); Roney et al. (2017). Other studies focused on technostress (Burke & Ellis, 2016; Tacy et al., 2016), teaching satisfaction (D'Souza et al., 2014; Howe et al., 2018) and work climate (Gonen & Lev-Ari, 2016). However, the focus on the academic and technology remained, and all the above studies provided insights into the aim of the thesis.

The qualitative studies limitations were also present. Three studies lacked discussion of how rigor was maintained during their research; Allan et al. (2012), although outlining how the focus groups were conducted and themes derived, did not report how rigor of the data analysis was maintained. Porter et al. (2020) outlined the use of Creswell (2003) method of thematic analysis but did not report on how the themes were reviewed and Sinacori (2020) lacked discussion of how the data was analysed and how themes were reviewed. Two studies had bias that was not addressed in the studies. In a study of teachers’ views of elearning for non-traditional students, participants were split into two groups: more experienced or less experienced, with elearning (Allan et al., 2012). However, the studies did not report on how this was defined, other than individual’s self-selected, making the meaning of each group vague. A study of teachers’ experiences of teaching into a blended learning nursing programme was conducted by members of the same faculty as the participants (Jokinen & Mikkonen, 2013). This was not addressed by the authors of the study and may have led to unintended bias in the focus group interviews. The aims of some qualitative studies were narrow, for example, online teaching was the focus of three studies (Gazza,

2017; Smith & Crowe, 2016; Wingo et al., 2016) and, although online teaching is delivered with technology, the studies may have missed elements of technology used in blended or face-to-face teaching, as well as excluding participants who used technology, but did not teach online. Three studies were focussed on specific technologies in teaching: iPads (Stec et al., 2020), electronic health records (Kowitlawakul et al., 2014) and lecture capture (recording) (Freed et al., 2014). Although these studies may reveal general attitudes to technology, they may also have findings that are applicable only to the technologies considered, lacking broader application to technology use in general. Finally, four studies focussed on the transition to technology; two considered the transition to online teaching (Sinacori, 2020; Sword, 2012) while two considered the transition to blended learning (Porter et al., 2020; Sweeney et al., 2016). These studies may provide insights into the challenges posed by technology, but the findings may also capture attitudes to change rather than technology itself.

Two studies employed mixed methodologies in their studies (Jones et al., 2016; Moule et al., 2010); both lacked survey reliability testing and, as previously discussed, this may impact the repeatability and consistency of results. Both studies described thematic analysis of the data, although neither reported on methods to increase rigor. Finally, the study exploring nursing faculty's attitudes to blogging used the open-ended section of their survey for the qualitative aspect of their mixed methodology, an approach that Creswell and Creswell (2018) suggests; mixed methodology requires intention and integration of the data, which is lacking in this study (Jones et al., 2016). Moule et al. (2010) included academics, educational designers and managers in their sample, creating issues of focus on nursing lectures, although nursing academics were identified in the study and the findings from their viewpoints were easily discerned.

Current literature review limitations

The exclusion of studies prior to 2010 is seen as a strength of this review, as the rapid changes that occur with technology make older studies outdated. The focus on nurse

academics was also seen as a strength, as the exclusion of other disciplines allows the unique discipline of nursing to be clear. The lack of non-English literature is a limitation as other countries may have researched in this area. Finally, the review is limited to available articles through Federation University and publicly available publications.

2.6 Summary

This review sought to determine nurse academics' attitudes to technologies in teaching within the literature and found seven themes: *Academics' attitudes towards technology*, *Training and support for teaching with technology, Knowledge of technology*, *The impacts of technology on academics' time*, *Academic demographic influences on technology use*, *Academic concerns for technology and nursing students*, and *Nursing pedagogy and technology in teaching*. There is an apparent interconnectedness between the emerging themes, such as, improving nurse academic training would increase knowledge (and possibly decrease time). This indicates that changes to any areas discussed above could have impacts across many other areas, potentially increasing the impact of any intervention. Although the studies varied in methodology and tools used to gather data, the results demonstrated that nurse academics had similar attitudes, barriers and concerns with technology in teaching. Given the effect of technology on both teaching and learning, it is important to understand the nurse academics' perspectives.

Within the theme, nurse academics' attitudes towards technology, both positive and negative, were discussed. Studies noted that a positive attitude to technology was associated with increased technology engagement. Negative attitudes were influenced by pedagogy, training, and time concerns and, addressing these, may reduce the negative attitudes to technology in teaching.

Training and support for teaching with technology was an important aspect and very apparent in the literature. Training should address the needs of the academic, rather than being generic. The support offered should be both formal, such as technical support, and

informal, such as peer support. Training was shown to be associated with technology engagement of nurse academics.

Knowledge of technology was also required for the nurse academic to fully utilise technology in their teaching. There was a need to understand, not only what technology worked, but also when it should be used and how to use it. This may be addressed by increased training and increased time allocation to allow the nurse academic to more fully understand the technology that can be used in their teaching.

The impact of technology on academics' time was a very common concern for nurse academics in regard to technology in teaching. They required time to understand, time to implement and time to review technology. Time was also required to support student engagement with technology. The main concern was that teaching with technology requires an increased time commitment, resulting in an increasing academic workload.

Academic demographic influences on technology use, such as, gender, academic rank or age, appear to have little effect on the use of teaching with technology. The literature demonstrated demographics had either no effect or only slight effects on technology use in teaching.

Although not a focus of the review, the academic view of nursing students and technology is important to consider as it may impact the way in which academics engage with technology in their teaching. Although academics assumed students were the drivers for technology use, some academics noted that students showed a preference for more traditional teaching methods (face-to-face teaching). Assumptions of digital literacy and access to technology were shown to be inaccurate. Nurse academics noted that they had to consider the potential impact on student learning when exploring technology use.

Nurse academics had very real concerns about the impact of technology on nursing education. Nursing is seen as an interpersonal profession, and the effect that technology may have on this, particularly during student formation into a professional nurse, was raised by several studies. Although beneficial aspects of technology were acknowledged, academics were cautious about the use of technology. The primary concern was whether

technology added value to the learning experience.

The findings highlight that nurse academics who are teaching with technology face similar issues across the world. However, lack of insight into Australian nurse academics' perceptions and experiences was noted, given only one included study was based in Australia. There is a lack of large, national studies that consider nurse academics across many higher education institutes. There is also a lack of consideration of the impact on attitude on the broader use of technology in teaching. Once measured, attitude change could be assessed over time or in response to certain events (such as the sudden shift to online learning during COVID lockdowns). In addition, it should be noted what lies behind attitudes to technology—exploring why nurse academics hold these attitudes. Exploration of the reasons for nurse academics' attitudes to technology may provide invaluable insight into how to engage them with technology. This chapter provided a review of the literature on nurse academics' attitudes to technologies in teaching. The next chapter discusses the methodology and methods used in this mixed methods study.

Chapter 3: Methodology and Methods

3.1 Introduction

The literature review in the previous chapter identified a lack of broad and in-depth research considering the attitudes of nurse academics towards teaching technologies. The review identified seven themes relating to nursing and technology: *Attitude*, *Training and support*, *Knowledge*, *Time*, *Demographic factors*, *Nursing students* and *Nursing pedagogy*. However, there was a lack of large studies focussed upon technology in general (rather than specific technologies). In addition, only one study was conducted in Australia. Hence, this study was designed to address the research question: How do Australian nurse academics' attitudes to technology influence their use of technologies in teaching?

This chapter provides a description of the research methodology, as well as the rationale for the chosen design. A brief description of mixed methods research is provided and the rationale for the research methods, as well as key design decisions about the sequence, priority and integration of the quantitative and qualitative phases. Details about the sampling methods and procedures for each data collection period in Phases one and two are provided. Finally, ethical issues pertinent to the design, conduct and data management are presented.

3.2 Research Design and Methodology

3.2.1 Research aims

The overall aim of the study was to explore nurse academics' attitudes to technology and the influence attitude has on their use of technologies in teaching. There were three objectives:

1) To investigate nurse academics' attitudes to technology through the Technology Readiness Index 2.0 (TRI 2).

2) To develop an understanding of how and why nurse academics engage with technology through individual interviews.

3) To integrate the quantitative (Objective 1) and qualitative (Objective 2) findings in order to gain a holistic understanding of academics' use of technologies in teaching.

3.2.2 Philosophical Assumptions

A worldview, or paradigm, describes the beliefs or assumptions that researchers hold which influence and guide their enquiries (Creswell & Plano Clark, 2018). A worldview consists of a triad of fundamental philosophical concepts: ontology, epistemology and methodology (Morgan, 2013). Traditionally, the two primary worldviews are positivism and constructivism; positivism posits that truth is an objective single reality, measurable and able to be tested, while in contrast, constructivism acknowledges multiple realities, that are observable and able to be interpreted in their context (Creswell & Plano Clark, 2018; Morgan, 2013).

The positivist paradigm has assumptions that hold true more for quantitative, as opposed to qualitative research (Creswell & Creswell, 2018). This worldview is also known as post-positivism, empirical and scientific method. Positivism is defined by a deterministic philosophy where outcomes have a cause and positivists seek to determine the cause. This worldview is reductionist, in that it attempts to reduce ideas into small discreet hypotheses that can be tested. The means by which positivists develop knowledge are through observation and measurement (Creswell & Creswell, 2018). This results in the positivist claiming an ability to measure objective reality. The result of measuring human behaviour is that numeric measurements of observation must be developed. The research method of positivism, therefore, is the scientific method where a hypothesis is developed, data gathered, and the data supports or refutes the hypothesis. In terms of ontology, the positivist believes that the world is external and that a single objective reality is related to any phenomenon, unaffected by the researcher's or participant's perspective (Park et al., 2020).

Therefore, the nature of knowledge (epistemology) is that it represents truth and that knowledge is certain and congruent with an objective, real world (Park et al., 2020).

Constructivist worldviews differ from positivist and are more likely to be used for qualitative research. Constructivism is defined by the idea that knowledge is socially constructed and there may be multiple realities held by different individuals (Creswell & Creswell, 2018). This leads the researcher to consider the complexity of views, with the researcher seeking to rely on participants' views of the phenomenon being studied (Creswell & Creswell, 2018). The researcher seeks subjective meanings that participants expound which are affected by social, historical and cultural norms. Constructivists acknowledge that their own background is also shaped by the same factors and that these effect the interpretation of the participant response. The constructivist intent is to interpret the meanings that others have of the world. Knowledge is developed out of the meaning that the researcher interprets. The methods that constructivists use are varied, such as interview or focus groups, however they are designed to enable the participant voice to be heard and create knowledge about the phenomenon or area of study (Creswell & Creswell, 2018). The ontology of constructivism then, is that reality is made up of multiple individual and group mental constructs including social, experiential, specific, and local, with knowledge being socially constructed and subjective (Guba & Lincoln, 1994).

A worldview positioned midway between the assumptions of positivism and constructivism is pragmatism. The worldview of pragmatism posits truth as both objective and socially constructed; knowledge is experienced individually, but also created through socially shared experiences and that the methodology chosen is that which best answers the research question (Morgan, 2013). This means that rather than a priori reasons, fixed principles and absolutes, pragmatism deals with the facts as they exist in relation to the current inquiry. The goal of pragmatism is resolution of the inquiry (Morgan, 2013).

Pragmatism originated in the United States in the 1870s and its origin is usually attributed to Charles Sanders Peirce (1839-1914). The pragmatic philosophy was further developed and

popularised by William James (1842-1910), who led a pragmatic focus on theorising inquiring, meaning and the nature of truth. Additionally, there was John Dewey (1859-1952), who led a pragmatic focus on politics, education and social improvement (Legg & Hookway, 2021). The philosophy of this current research is based on this 'classical' philosophy of pragmatism. According to Dewey, traditional epistemologies, whether positivism or constructivism, had drawn too stark a distinction between thought, the domain of knowledge, and the world of fact; thought was believed to exist apart from the world, epistemically as the object of immediate awareness, ontologically as the unique aspect of the self (Field, 2020). For the pragmatist, the scientist or researcher must turn away from a priori reasons, from fixed principles and from absolutes and deal only in facts as they exist related to an inquiry at hand. The goal is resolution of the inquiry. It does not mean that the scientist or researcher must discard all logic and rigor; rather, that abiding within paradigmatic dogma inhibits the ability of the researcher to resolve the inquiry (Florczak, 2014). For pragmatism, resolution of the inquiry is more important than following a rigid paradigm.

According to Webb (2007), classical pragmatism has four significant features. First, pragmatists posit that although reality may exist external to perception, it is only through human experience that they are encountered. As such, truth does not exist independent of thought. However, some truths are more universal than others, and the world has an 'obdurate' quality that allows for further action in one direction while resisting actions in other directions (Morgan, 2013). Second, scepticism is not a requirement for the pursuit of truth. Therefore, the "requirement that knowledge must begin with an absolutely certain truth and that all else should be treated with scepticism" (Webb, 2007, p. 1068) is unnecessary. This is best illustrated by an example used by Dewey as, 'a noise heard in the dark'. In this example, the initial noise is experienced as fearsome; subsequent inquiry reveals that the noise was benign—a tree scraping on the window. The subsequent inquiry does not change that initially the noise was fearsome (Florczak, 2014). This demonstrates that the beginning of inquiry does not need to be certain truth. Such aspects of pragmatism work hand-in-hand

with fallibility, the third feature of pragmatism. Fallibility considers that nothing is beyond future reconsideration, even basic scientific knowledge (Webb, 2007). Such reconsiderations carry the possibility of modifying or rejecting the prior belief (such as, from the previous example, reconsidering the cause of a noise). Any inquiry that produced knowledge holds this status provisionally, as long as the knowledge provided a coherent understanding of the world as a basis for human action (Field, 2020). An example of this is in physics as sub-atomic knowledge is generated (such as quarks and Higgs boson particles), the understanding confirms or shifts theories and aids further understanding. Lastly, according to classical pragmatism, neither scientific knowledge nor common sense, is privileged (Webb, 2007). Either or both may be relevant in any given context of inquiry, as inquiry for pragmatism is pan-critical. Pragmatism considers that all knowledge from the relevant scientific disciplines and from other sources (such as common sense, experience) should be bought to bear in an inquiry (Webb, 2007). This allows a pragmatist to consider inquiries that are affected by social or cultural norms or influences and to seek methods that generate answers apart from the scientific method.

Pragmatism does not attempt to escape the push and pull of traditional methods, but considers that we are always in the middle of things – existentially, culturally, biologically, scientifically and historically (Webb, 2007). The pragmatic philosophy of this research supports the view that while quantitative (positivism) and qualitative methods (constructivism) are distinct, they are also commensurate in that they both advance knowledge, valuing both objective and subjective knowledge (Doyle et al., 2009).

Given the above, the pragmatic views of ontology, epistemology and methodology are as such. Pragmatism views reality as existing apart from human experience but can only be encountered through human experience (Morgan, 2013). Pragmatism also argues that since all knowledge is gained through experience, the world is both real and socially constructed. Although individual knowledge may be unique, there is also a large amount of knowledge that is shared because it comes from socially shared experience. Methodological

considerations of pragmatism are most concerned with why one way of research is chosen over another (Morgan, 2013). Rather than a connection between a paradigm and methods (such as positivism and the scientific method), pragmatism is more concerned with what methods will achieve an answer to the research question (Kaushik & Walsh, 2019). The pragmatic approach was deemed the paradigm that best fit the research aim for this study. Given the pragmatic approach is the worldview of this study, the research aims of the present study are discussed below in relation to the best method to achieve these aims.

3.2.3 Research Aims and methods

This section considers the methods used to answer the research question in line with the pragmatic philosophy. The first research objective was: To investigate nurse academics' attitudes to technology through the use of an attitudinal survey. This objective has a predominantly positivist worldview. A survey tool was determined to be the best fit to answer this question, however, the researcher required a tool that could answer the question in relation to academics' attitudes. As technology has become ubiquitous in the higher education setting (Brown, 2016), the experience of using technology in teaching for nurse academics is assumed to be fairly universal; that is, a single reality that is socially shared. However, the survey sought to measure the individual's attitudes allowing the observation of their subjective reaction to technology in teaching.

Second research objective: To develop an understanding of how and why nurse academics engage with technology employing individual interviews. This research objective was achieved by developing an understanding of nurse academics' engagement with technology. The objective was guided by the constructivist worldview, and as such, the method to answer this aim reflected this worldview. Although individuals may hold similar attitudes, their experiences and reasons for holding such attitudes are unique. Semi-structured, individual interviews that would allow each person to respond in their own way and to

interact with the researcher, was deemed the most appropriate method to elicit the potential varying viewpoints on technology in teaching.

The third research objective: To integrate the quantitative (Objective 1) and qualitative (Objective 2) findings in order to gain a holistic understanding of academics' use of technologies in teaching. The third research objective combined quantitative and qualitative data from the prior objectives. Pragmatism was the guiding worldview for this research objective and could shift back and forth between specific examples and their more general implications (Morgan, 2013). This was consistent with the third research objective as technology, by its very nature, is context dependent (for example, due to the ever-evolving nature of technology), but the researcher sought to consider more general aspects (such as academics' attitudes to technology). By merging both aspects, this study explored how context, individual and general aspects interacted and the outcomes of such for engagement with technology in teaching. The next section considers the methods employed to investigate the research aim and objectives.

3.3 Research Methods

Due to the philosophical nature of the research objective discussed above, the most appropriate research design from a pragmatist philosophy was mixed methods. A central premise of mixed methods research is that the combination of research approaches provides a better understanding of the research question, than either approach alone (Creswell & Plano Clark, 2018). Mixing of qualitative and quantitative research designs, as a unique form of research itself, is normally attributed to the work of Campbell and Fiske (1959), describing the process of triangulation. There is, however, an argument that combining quantitative and qualitative research likely predates Campbell and Fiske but was not recorded as mixed methods or recognised as a unique form of research (Maxwell, 2016). Mixed methodology evolved through a formative period (1950s to 1980s), a period of paradigm debate (1970s to 1980s), and a

procedural development period (1980s to 2000s) (Creswell & Plano Clark, 2018). It is now considered to be in the reflective period, and mixed methods research offers nurse researchers an essential methodology that allows them to address complex issues (Halcomb & Hickman, 2015).

Mixed methods research encourages the use of multiple worldviews, as mixed methods is both a practical and natural approach to research (Creswell & Plano Clark, 2018). This is congruent with the underlying philosophy of pragmatism, as discussed prior in this chapter. Mixed methods allows for collection and integration of qualitative and quantitative data, in doing so, the resulting research has broader application (quantitative) and allows for deeper understandings (qualitative) of the research question (Creswell & Plano Clark, 2018).

The overarching research question of this study was: How do nurse academics' attitudes towards technology influence their use of technology in teaching? As such, survey data alone would only provide a numerical value of attitude to technology, and hence would lack a sense of the academic experience or any reasoning behind the numbers. However, without the quantitative data, a sample of participants with a broad range of attitudes would not be able to be identified for the qualitative component and the resulting interviews would lack the ability to generalise results. Alternatively, qualitative data alone (although giving insight into the context and individual experience of using technology), would not allow the research to determine if there are more broad and general attitudes to technology for nurse academics. Hence, the rationale for using mixed methods was that the design would more fully answer the research question.

3.3.1 Mixed methods design decisions

According to Creswell and Plano Clark (2018), decisions related to mixed methods research design require the researcher to address three key questions:

- In what sequence will the use of the data from quantitative and qualitative data collection be used?

- How will the data from qualitative and quantitative sources be integrated?
- What priority will be given to quantitative and qualitative aspects of the study?

These decisions guide the research to one of the common six mixed methods designs: Convergent, Explanatory Sequential, Exploratory Sequential, Intervention, Transformative and Multiphase (Creswell, 2013).

Sequence refers to the order in which the dataset (in this study, quantitative and qualitative datasets) of the study is collected and analysed (Ivankova et al., 2006). Data from qualitative and quantitative collection can either be used sequentially or concurrently (Andrew & Halcomb, 2009). In this study, the research question was best answered by first identifying what attitudes nurse academics had towards technology through a survey (quantitative). Then, the attitudes could be further examined using individual interviews (qualitative). Therefore, the quantitative aspect would be followed by the qualitative aspect of the study.

Integration entails the 'mixing' of data components (in this case, quantitative and qualitative data) of mixed methods research (Andrew & Halcomb, 2009). Creswell and Plano Clark (2018) describe that integration can occur by merging datasets, embedding one dataset within another or connecting data analysis to subsequent data collection. For the current study, it was assumed the results of the quantitative data collection would influence the qualitative data collection. However, the main area of integration involved merging the results of both quantitative and qualitative data at the interpretation phase (presented in Chapter Six of this thesis).

Priority refers to relative emphasis placed on the two approaches (Andrew & Halcomb, 2009). The two possibilities are equal or unequal weighting, with equal weighting giving both methods equal importance in addressing the research question, while unequal places greater emphasis on one of the methods (in this study, qualitative or quantitative) over the other (Creswell & Plano Clark, 2018). The decision of priority can be influenced by both theoretical and practical considerations. The theoretical influence of this

research was pragmatism, which enables either equal or unequal weighting. Traditionally, explanatory designed mixed methods studies have quantitative priority, but the need for the qualitative data to fully answer the research question in this study required the priority to be equal. Originally, the researcher assumed the larger quantitative component would mean priority was given to the quantitative data. However, Ivankova et al. (2006) note that the power of one phase can become more apparent during data collection or analysis, which also occurred with this study as the richness and depth of qualitative data became apparent, leading the researcher to give each phase equal weighting.

After review of the three key questions, the research design choices for this study are best described as a mixed methods sequential explanatory design. This fits with the philosophy of pragmatism and has the potential to best answer the research aim and objectives. The study, therefore, occurred in two phases, phase one being a quantitative survey and phase two as individual interviews.

Data analysis of mixed methods is chosen based upon pragmatic principles: “what will best answer the research question” (Kaushik & Walsh, 2019). For the quantitative data, statistical analysis was used to determine if relationships existed between variables. Statistical decisions are discussed later in this chapter. The researcher considered several methods to analyse the qualitative data, discussed further in the phase two section of this chapter.

To summarise, the aim of the research was addressed through a mixed methods design comprising two phases of data collection. The phase one objective was to investigate nurse academics’ attitudes to technology through a survey, while the phase two objective was to develop an understanding of how and why nurse academics engage with technology employing individual interviews. The final objective: to integrate the quantitative (Objective 1) and qualitative (Objective 2) findings in order to gain a holistic understanding of academics’ use of technologies in teaching, which was achieved by synthesis of phases one and two

and addressed the final research objective. The next section discusses the methods utilised in phase one and then phase two of this study.

3.4 Phase one: Quantitative Survey

3.4.1 Introduction

The research objective that guided phase one was to investigate nurse academics' attitudes to technology. Phase one involved a quantitative survey that incorporated the Technology Readiness Index (TRI) 2.0 (Parasuraman & Colby, 2015). This is a measure of the propensity of an individual to utilise and adopt technology to achieve goals, either in work or personal life, and are discussed in detail below (Parasuraman & Colby, 2015). The purpose of the survey was to gather technology readiness data (via the TRI 2.0 questions) and descriptive data representative of the nurse academic population. Survey data were then used to analyse influence of demographic factors, such as age or gender, on technology readiness of nurse academics. Data from phase one were analysed using statistical analyses described in detail in Section 3.4.8 of this chapter (also see Figure 3.1). Data were also sent to Rockbridge Incorporated for proprietary analysis of the components that results in allocation of individuals into one of five groups, which is referred to as TR (technology readiness) groups in this study. Further explanation is presented in the next section (3.4.2). The next section of the phase one methods will discuss the Technology Readiness Index, additional information collected from the survey, survey procedure, data analysis and influence of phase one on phase two.

3.4.2 Technology Readiness Index 2.0

In phase one of this research, the researcher aimed to collect quantitative data on attitudes to technology. Attitude was the focus, rather than efficiency, ability or technostress (a state of stress related to technology use [La Torre et al., 2019]). Two

survey instruments were found that had potential to achieve this objective: the Technology Acceptance Model (Davis, 1989) and the Technology Readiness Index (Parasuraman, 2000).

The Technology Acceptance Model (TAM) (Davis, 1989) was considered for use in this study. Developed by Fred D. Davis, the TAM consists of two components that influence an individual's intention to use new technology, namely perceived ease of use and perceived usefulness. Ease of use is defined by Davis (1989, p. 320) as "the degree to which a person believes that using a particular system would enhance his or her job performance". Usefulness is defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989, p. 320). The TAM has also since been updated to TAM2 by Viswanath Venkatesh, designed to include in the survey more aspects such as control, motivation and emotion, but these are still related to a specific technology (Venkatesh, 2000).

TAM has been widely used, however, the focus on ease of use and usefulness of particular technologies was considered problematic for this study. Even common components of elearning, such as Learning Management Systems (LMSs), have several different versions (such as Blackboard or Moodle) or varying iterations, making comparisons between institutes impractical. The pace of technological change may also render such a measurement obsolete as a new technology or new version of an existing technology may be significantly different to an existing technology. More importantly, the phase one research objective was not to identify attitudes to specific technologies themselves, but nurse academics' attitudes to adopting technology in teaching. Therefore, TAM would not be able to provide the individual attitudinal data in relation to technology more broadly and is not the best fit to achieve the research objective.

The Technology Readiness Index (TRI) was developed by A. Parasuraman, and updated by Parasuraman and Charles Colby to the TRI 2, and is a measure of the propensity of an individual to utilise and adopt new technology to achieve goals, either

in work or personal life (Parasuraman & Colby, 2015). TRI 2 consists of 16 items in which participants indicate their level of agreement on a five-point Likert scale with an unsure option, from strongly disagree to strongly agree. The 16 items measure four components that influence technology readiness: Optimism, Innovativeness, Discomfort and Insecurity. Four items are allocated to measure each component, hence the final item number of 16. Parasuraman and Colby (2015, p. 60) define the components as:

- Optimism—a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives. This component captures positive dispositions to technology.
- Innovativeness—a tendency to be a technology pioneer and thought leader. This component captures the degree to which the participant perceives themselves at the forefront of technology use.
- Discomfort—a perceived lack of control over technology and a feeling of being overwhelmed by it. This component measures the fear and anxiety participants may feel when using technology.
- Insecurity—distrust of technology, stemming from scepticism about its ability to work properly and concerns about its potential harmful consequences. This component measures the negative disposition to technology and what it can achieve.

Optimism and Innovativeness are motivators which increase the TRI score, while Discomfort and Insecurity are inhibitors which decrease the TRI score. The final TRI score is measured on a scale of one to five, with five being most technology ready, and one being the least (Parasuraman & Colby, 2015).

Based on TRI 2 scores on the index's four components, Parasuraman and Colby (2015) derived a proprietary segmentation scheme that categorises participants into five technology adoption segments, (Explorers, Pioneers, Sceptics, Hesitators, and Avoiders). This study refers to the segments as TR groups (rather than segments). An explanation of each group is as follows:

- Sceptics - tend to have a detached view of technology, with less extreme positive and negative beliefs.
- Explorers - tend to have a high degree of motivation and low degree of resistance.
- Avoiders - tend to have a high degree of resistance and low degree of motivation.
- Pioneers - tend to hold both strong positive and negative views about technology, and
- Hesitators - stand out due to their low degree of innovativeness.

(Parasuraman & Colby, 2015, p. 71)

A basic indication of the five TR groups and the relative component scores of each component are below:

Table 3.2 – TR Groups and Relative Component Score

TR group	TR index (rank)	Optimism	Innovativeness	Discomfort	Insecurity
Explorers	1	High	High	Low	Low
Sceptics	2	Low	Moderate	Low	Low
Pioneers	2	High	High	High	High
Hesitators	4	High	Low	Moderate	Moderate
Avoiders	5	Low	Low	High	High

(adapted from RockBridge Incorporated, 2014)

The TR groups allow for the degree of motivator and inhibitor scores to determine the groups, providing a more realistic and nuanced view of behaviour, rather than the broad TR index which combines the scores into a numerical value (Parasuraman & Colby, 2015). For this study, it was decided to use both the TR index to consider technology attitude more broadly, while also allowing for the use of inferential statistics using the TRI index, and the use of TR groups to explore a more nuanced view of technology attitude based on the components of the TRI 2.

The TRI 2 has been previously tested for factor structure, reliability, discriminant validity and construct validity and found to be a reliable and valid tool in studies involving the general public (Meng et al., 2009; Parasuraman, 2000; Parasuraman & Colby, 2015). The study authors tested reliability and validity using online and mail distribution to a population representative of the United States census, a total of 878 participants (Parasuraman & Colby, 2015). Construct validity was confirmed by comparing TRI score (in terciles) to participants' technology ownership (such as smart phone, tablet, laptop), intention to acquire technology (in the next two years) and non-intenders using analysis of variance (ANOVA). Means for owners and intenders were higher than the mean for non-intenders. The difference was statistically significant for all technologies except mobile phones. In addition, TRI 2's association was examined with 23 online behaviours (such as booked travel online, streamed music). In this analysis, survey respondents were divided into three approximately equal-sized groups based on their TRI 2 scores—low TR tier, middle TR tier, and high TR tier. A Pearson's Chi squared test showed TR is significantly associated with 23 behaviours, with increasing engagement incidence from low to high tiers (Parasuraman & Colby, 2015). Engagement with social media was also examined and TRI scores were found to be associated with having a social media page ($t = 4.16$, $p < .0001$). Mean TRI score was also higher across all 11 social media survey questions. TRI 2's ability to consistently differentiate across multiple technology-related behaviours supports its construct validity. Factor analysis of the 16 items found a four-factor solution explained 61% of the variance. Cronbach's alpha ranged from .70 for discomfort to .83 for innovativeness, meeting the minimum reliability threshold (Kline, 2005). Factor structure was also distinct with clean item loading on the respective components (cross loadings less the 0.3 with one exception) and all loadings were strong (.59 or higher) (Parasuraman & Colby, 2015). A confirmatory factor analysis of the measurement model (with four latent constructs representing the four components and the corresponding items specified as manifest variables) was conducted using AMOS. The model produced a significant

variable likely due to the large sample size ($p < .01$) (Bagozzi & Yi, 1988). Goodness of fit statistics were: goodness-of-fit index = .95; non-normed fit index = .92; comparative fit index = .94; root mean square residual = .06 (Parasuraman & Colby, 2015). Confirmatory factor analysis was used to assess discriminant validity by comparing each latent dimension's average variance extracted (AVE) with the correlations among dimensions to determine if items within each dimension correlate more highly with one another than with items outside their parent factors. Optimism and innovativeness showed high level discrimination, while discomfort and insecurity met the minimum threshold for acceptable discriminant validity (Parasuraman & Colby, 2015).

Previous TRI survey use has primarily been in the technology consumer area, while TRI use in the academic field is relatively unique and literature on TRI in higher education is sparse. Application of the TRI on nurse academics has occurred in two previous studies; a study focussed on technology readiness and simulation use of nurse academics (n = 662), based in the United States, found Cronbach's alpha of .79 and construct validity of the TRI to be strong, as TRI scores matched technology use in the study (Duvall, 2012). Another study, a national survey in South Africa assessing perceptions of academic nurse educators (n = 79), reported the TRI to have face and content validity from an expert review, but reliability testing was not performed (Vuuren et al., 2018). It should be noted that the two studies of nurse academics above used the original TRI, not the TRI 2, so the validity and reliability testing may not accurately represent the use of TRI 2 in this study. Academic permission to use TRI 2 survey was sought and granted from survey authors, Parasuraman and Colby (See Appendix D).

3.4.3 TRI Critique

A meta-analysis of technology readiness revealed several criticisms of the TRI (Blut & Wang, 2020). Blut and Wang (2020) suggest that the one-dimensional model (the TRI score) is overly general, while the four dimensional (TR groups) is a more complete

model but complex. The use of both in this study allowed for both general and more complete understandings of technology readiness. TRI was also found to be influenced by whether technology use was ‘voluntary’ rather than ‘forced’ (such as technology required for occupations) (Blut & Wang, 2020). Academia is likely a mix of these settings, as some aspects of technology use are forced (email, LMS) while use of other technologies are more voluntary (Second Life, live documents, e-polling). Finally, Blut and Wang (2020) observed that most TR effects are significant and that TR is an antecedent to self-efficacy, risk and attitude because it is a technology-related personal trait, while other constructs (such as the TAM) are specific beliefs about and, attitudes toward, a specific technology. Given the research objectives were based on the academics’ attitudes to technology more broadly, the use of TRI for this research was justified.

3.4.4 Survey elements and item justification

Several questions were included in the survey, in addition to the TRI questions, in order to more fully understand the nurse academics. This section discusses those additions and justification for their inclusion.

Demographic information relating to age, gender and qualification were included for descriptive reasons, but also due to differences found by prior studies using TRI (Makkonen et al., 2017; Rojas-Méndez José et al., 2017). Demographic data allowed the researcher to examine if prior studies’ findings held true for nurse academic participants.

Further information regarding participants’ academic and nursing experience was also sought. This included experience (years as RN, years at HEI), nursing background, position and which HEI the participants were employed, in order to determine if these parameters effected TRI. For example, the individual HEI may have revealed differing supports or institutional culture that influenced TRI.

The number of technologies engaged with was based on the Parasuraman and Colby (2015) finding that TRI was associated with the number of technologies owned and intention to use/buy technologies. The study focus, academic engagement, sought to discover if the technologies used in teaching were associated with TRI. The list was based on similar studies that considered technologies academics used in teaching (Chimbo & Tekere, 2014; Turan et al., 2019). The item list within the survey had 17 items of varying teaching technologies where participants selected how many they had engaged with in the previous 12 months. The list was not designed to be comprehensive nor exhaustive, but rather, aimed to capture a mixture of technologies used in elearning. Consideration was given to using the conversational framework (Laurillard, 2002), however this requires information regarding how technology is used, not just what types. Some of the types were also broad categories that enable multimodal ways of engaging which would also render this framework difficult. Types of technologies included were a range of more basic technologies (email), LMS engagement, web 2.0/collaborative technologies as well as synchronous/asynchronous technologies. This was an attempt to determine if TRI was related to these types of technologies. Data analysis revealed that the most instructive measure was total number of technologies engaged with, expressed as a sum (that is, if a participant indicated use of 6 technologies, their score was 6).

Frequency of engagement was included as prior studies have indicated that frequency of engagement may be linked to technology competence and attitude to technology (Ainley & Engers, 2007; Hunter et al., 2018). In addition, as discussed above, Parasuraman and Colby (2015) found engagement with technology was associated with TRI score. This item's purpose was to determine if frequency of engagement was associated with technology readiness.

Confidence with technology has been shown to be a potential barrier to technology use and engagement (Haythornthwaite, 2007; Vogel et al., 2019). Level of agreement with

the statement: “I am confident engaging with teaching through elearning.”, used a five-point Likert scale. Self-rated confidence was then compared to the TRI score to determine if there was any association between TRI and confidence.

A free-text entry was created with the statement, ‘Please add any further comments below’. This was designed to capture any thoughts or expressions that the participants felt were relevant but not addressed by the survey.

The final page of the survey had a summary page with a real time participant average score across the four TRI components: Optimism, Innovation, Discomfort and Insecurity (See Appendix E). The purpose was multifaceted, as this allowed participants to reflect on their TRI component score (the scores were calculated once participants had completed that section of the survey), it also allowed the researcher to purposively select interview participants and the component scores were utilised during interviews in phase two.

The survey was designed to take less than ten minutes to complete and to be accessible and easy to undertake across multiple platforms (computer, mobile, tablet) in order to increase response rate (Chyung et al., 2018). The survey was designed and hosted online by Qualtrics®, a web-based survey company. An introduction page was created to greet participants, followed by a demographic data page, and then by the TRI survey page. A final page included an option to participate in the second phase of the study (semi-structured interview). While the demographic data sequencing remained the same, the TRI survey questions were sequenced randomly (as suggested by the TRI authors) in order to prevent question order bias in the responses. A pre-test was conducted on the survey with five nurse academics, for feedback regarding clarity, ease of access and general feedback of the survey. Minor changes to some item wordings were enacted from the feedback to ensure clarity. A final version of the survey is in Appendix E.

3.4.5 Phase one procedure

The population targeted for the survey was full or part time academics who taught into the undergraduate Bachelor of Nursing courses in Australian HEIs. An email invitation was created with an attached Plain Language information Statement (Appendix F and Appendix G). A link to the survey was included in both the plain language information statement and email invitation. Implied consent was assumed upon survey completion, which was clearly explained in both email and plain language information statement. The Dean (or Head) of each nursing school in Australia was approached to disseminate the survey via email to their staff. The survey was online and live from September 2018 to January 2019. The initial invitation to participate was sent in September. A reminder was sent through the Deans (or Heads) in October 2018. A review of which HEIs had participated was conducted after the initial reminder and universities with low or no participation (less than two responses) were targeted through the researcher's supervisors' affiliations with relevant Deans (or Heads). If there had been no response from the Dean (or Head), publicly available emails of nurse academics were used to disseminate the invitation (two institutes' staff were approached this way). This resulted in a targeted reminder being sent in December (to both selected Deans and direct email as discussed above). Further reminders were discussed, but were considered intrusive and more than two reminders have been shown to have diminished response rates (Cho et al., 2013). The survey was closed in January 2019.

3.4.6 Sample size

Thirty-six institutes were identified as offering an undergraduate bachelor's degree in nursing in Australia in 2018. An approximate population of 1,000 academic staff was assumed, based on an approximate staffing of 30 full time academics per institute, which is consistent with the Australian National Health Workforce Dataset (2015) that indicated 3,578 employed across all tertiary institutes, including TAFEs, private providers and universities

(approximately 30% of which offered a Bachelor of Nursing). The sample size (confidence level = 95%, margin of error 5%) was determined using the sample size table from Price et al. (2005). The recommended sample size for the population of 1,000 was 277 participants. The researcher aimed to collect 300 surveys to account for incomplete and invalid completions by attempting to contact all academics employed at the time in HEIs. In total, 186 valid responses were obtained despite efforts to increase the sample size as outlined in the methods section and is a limitation of this study. This represents a response rate of 18.6%. Comparison between the resulting demographic characteristics of age and gender from the current study and the Australian National Health Workforce Dataset (2019) indicated that the sample was representative of the nurse academic population.

3.4.7 Data preparation for analysis

Data from the survey were downloaded directly from the online survey platform Qualtrics® as a .sav file and imported directly into SPSS® for data cleaning and analysis. The online data entries were spot-checked by the researcher to ensure that the data row and columns aligned. The free-text entry qualitative responses to the question “Please add any further comments below” were downloaded to Microsoft Excel® and directly imported into NVivo® version 12.0 (2018). After removing erroneous or irrelevant responses (such as ‘no response’) the final number of text responses used for analysis was 39. These responses were analysed using content analysis. Content analysis is a technique that can be used to study the response of open-ended survey questions by coding text into categories (Kleinheksel et al., 2020). Manifest content analysis was used for the open-ended questions, as the responses were short (generally one or two sentences), and there was a lack of contextual data to draw from. This involved identifying key words or phrases that identified the key points expressed in the text response section of the survey. Some text responses contained more than one code, hence the result of more codes than text responses. Common

elements were identified from the codes and categorised to form themes. The themes were ranked according to the number of responses, with percentage agreement being calculated using the total number of responses (*n* = 39). Despite the question being very open with little direction for participants, there were some themes that represented close to a quarter of responses. The results of the content analysis are discussed in Chapter 4 - phase one results. Data from the free-text responses to the question “What types of elearning have you used in your teaching in the past 12 months? – OTHER” were recoded into the sum of the elearning question, either increasing the technology count for that participant, or more commonly, being placed into the correct technology category (for example, some participants mentioned use of Canvas, a LMS, so this response would be re-categorised into the LMS category).

Where required, grouped data were collapsed for two reasons; either because the groups represented a more logical representation of the data, or due to low frequency. For example, qualifications data collapsed Bachelor, Graduate Certificate and Honours groups into a single group due to the similarity between Australian qualifications framework levels (the level given to these degrees by the Australian Government) and low numbers. Frequency of engagement groups (every other week, monthly, every other month) were also collapsed due to low participant numbers into a single category, less than weekly.

3.4.8 Quantitative Data analysis

Statistical analysis choices for the quantitative data were made based upon the broader research question, the questions related to the data and data type (nominal, ordinal or interval). Decisions regarding which tests to use can be seen in the decision tree (Figure 3.1). An expert statistician was consulted for the initial inferential statistical decisions and reviewed the final statistical tests and their conclusions. Data were analysed for normality and homogeneity using Shapiro-Wilk's test and Levene's test

respectively. The statistical test used, and justification for their use, are described below.

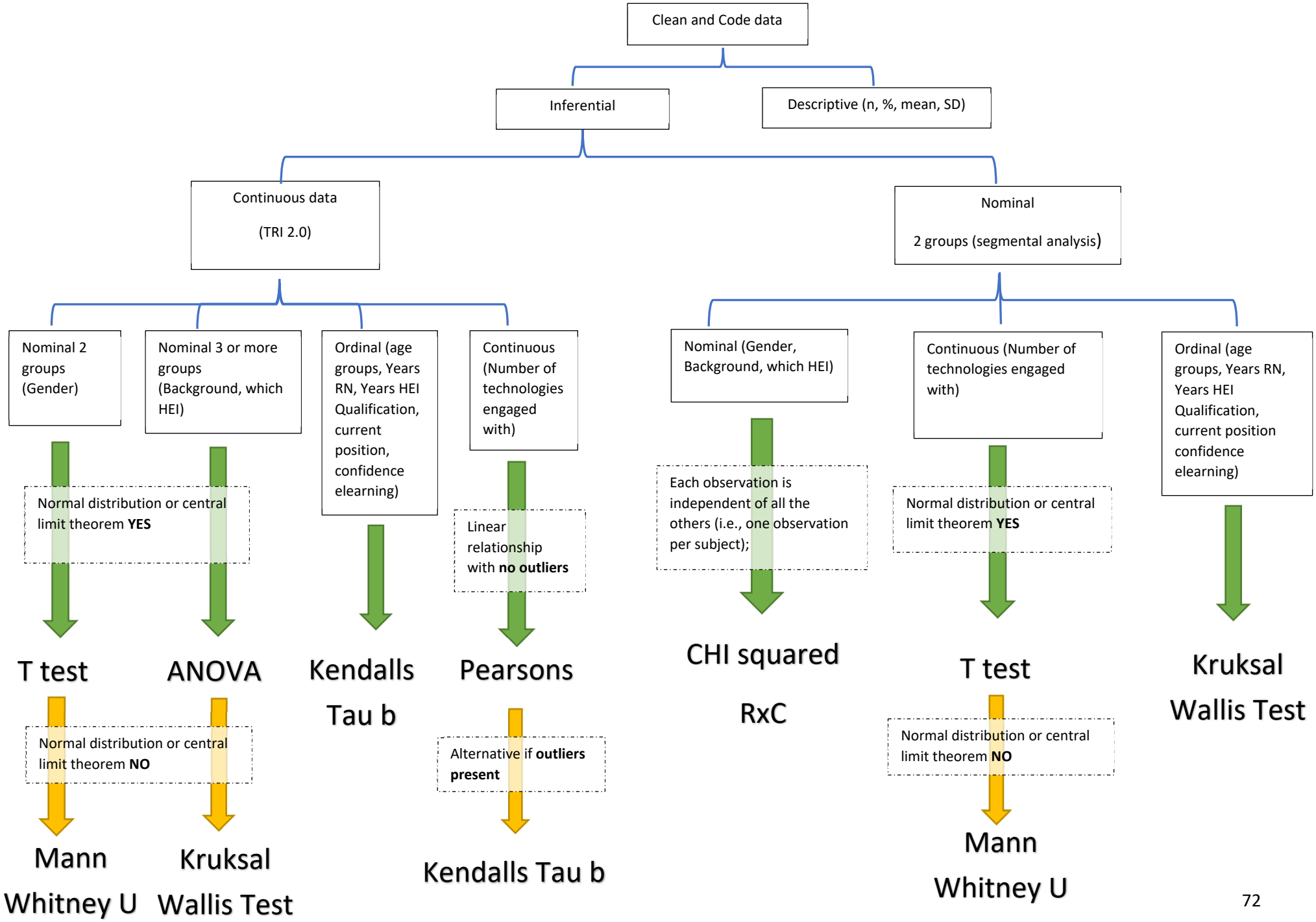

Figure 3.1 Data analysis decision tree

Descriptive statistics were used to summarise the data in a meaningful way and to allow the researcher to make sense of the data. Where data allowed, measurements of central tendency and measurements of spread were reported. Descriptive statistics were also valuable as a comparison point between the sample and the academic nursing population within Australia to determine if the sample was representative.

Pearson product-moment correlation was used to determine the strength and direction of an association between two continuous variables (Laerd Statistics, 2018). It generates a coefficient, *r* (Pearson correlation coefficient), that measures the strength and direction of a linear relationship, with a value -1 to +1, indicating a near perfect negative or near perfect positive linear relationship respectively (Laerd Statistics, 2018). A value '0' indicates no relationship between the two variables. Pearson product-moment correlation was used to test the relationship between TRI and the number of elearning technologies engaged with.

Kendall's Tau-b is a non-parametric test of correlation on at least the ordinal scale (Chen & Popovich, 2002). It measures ordinal association based on the analysis of concordant and discordant pairs (Kendall, 1938). It can determine strength and direction of a relationship between two variables and is considered an alternative to Spearman's correlation (Laerd Statistics, 2016). Kendall's Tau-b was chosen as it is more robust to outliers and is less effected by tied scores (Xu et al., 2013). It was used to test correlation between TRI score to age groups, years as RN, years employed at HEI, frequency of engagement with elearning and confidence with elearning. This was due to the data being ordinal in nature but representing real and distinct measurements.

Independent-samples t-tests were used to determine if a statistically significant difference existed between the means of two independent groups on a continuous dependent variable (Laerd Statistics, 2015b). A t-test was used to compare TRI based on gender.

One-way analysis of variance (ANOVA) was used to determine whether there were any statistically significant differences between means of two or more independent groups (Laerd Statistics, 2017). One-way ANOVA was used to compare TRI between qualifications, nursing background and to compare TR groups and the number of elearning technologies engaged with. ANOVA is an omnibus test statistic and cannot determine whether specific groups were significantly different from each other, as such post hoc testing was conducted using Tukey or Games-Howell to determine if there were specific groups that were statistically different from each other (Laerd Statistics, 2017).

Kruskal-Wallis H test is a rank-based nonparametric test that can be used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable (Laerd Statistics, 2015c). It can also be used in place of one-way ANOVA when the data fails to meet the normality assumption. However, it does not compare the mean of each group, but rather, ranks the scores of the dependent variable and compares the mean rank between groups to determine if a difference exists (Laerd Statistics, 2015c). Kruskal-Wallis H test was used to compare TRI score and academic position, and HEI that employed the participant. In addition, a comparison between TR groups and age group, number of years as RN, qualification level, academic position, number of years employed at HEI and confidence with elearning was performed.

Chi-square test of independence determines whether there is an association between two nominal variables (Laerd Statistics, 2015a). Chi-square achieves this by comparing observed frequencies in cells to the frequencies expected if there was no association between the two nominal variables. Frequencies are predicated on there being no association, the greater the association between the two nominal variables, the greater the observed frequencies differ to the expected frequencies, and the more likely a result is statistically significant. The reverse is also true, that is, the lower the association the

smaller the difference and the less likely a statistically significant difference will occur (Laerd Statistics, 2015a). The limitation of the Chi-squared analysis was that no more than 20% of the expected counts can be less than 5 and all individual expected counts are 1 or greater, meaning some groups could not be compared (Yates et al., 1999).

3.4.9 Phase one influence on phase two

Data from phase one influenced phase two in two ways, commencing with regards to areas that could be further explored in the semi-structured interviews. The researcher designed the survey to calculate the average component score in real time, allowing participants to see their scores for each component. This was also recorded and the output (average of each component: optimism, innovativeness, discomfort and insecurity) was compared to prior studies' average scores and the participants were asked to respond to this in the interview stage. This led to insights into why each participant held a particular attitude towards technology. In addition, the same average component of each participant from phase one was also used to select participants according to their component scores (e.g. high vs low, scoring participants across the four components). Morgan (2013) describes this approach as purposive sampling, a common technique used in mixed methods studies that allows for the selection of participants, using quantitative inputs to select for qualitative data sources. This was achieved with the three largest Technology Readiness groups (TR groups) represented in participants selected for phase two. The next section describes the implementation of phase two of the study, including interview procedure and thematic analysis of interview data.

3.5 Phase two: Qualitative component

3.5.1 Introduction

The phase two research objective was to develop understandings of how nurse academics engaged with technology in their teaching. Semi-structured interviews were designed to uncover information and insights into participants' behaviours, experiences, thoughts, feelings and perceptions of the topic or events under investigation (Morris, 2015). Data resulting from semi-structured interviews were collected to further explain the results from the TRI and to allow for deeper understandings of nurse academics' attitudes and engagement with technology.

3.5.2 Interview schedule

Semi-structured interviews are used to explore insider experiences, perspectives, thoughts and feelings about the study area (Liamputtong, 2009). An interview schedule was used to provide potential questions and prompts to elicit information about the participants' experiences, attitudes and perceptions about technology. Question development was guided by the topics necessary to cover the research question; however, the schedule was not always followed sequentially, but rather, information provided by participants guided the flow and sequence of each interview. Topics and guiding questions and prompts are detailed in Appendix H.

The planned interview structure was based on recommendations from Morris (2015). Interview details, research focus, definitions of terms (such as technology) and verbal confirmation of consent began the online interview. Interview questions began with the participant discussing the area/course that they taught into, as a way for the interviewee to discuss an area they felt comfortable and knowledgeable about and to build rapport. Core topics were then centred around technology in the interviewee's teaching (for example, how they engaged with technology in their teaching). Questions were designed to be open-ended

as this allows the participant to choose from a full range of possible responses to the question (Morris, 2015). Questions within topics were also adjusted during each interview, as needed, to facilitate data collection, a flexibility which is a feature of semi-structured interviews (Morris, 2015).

Interviews then focussed on the component survey results (relative to the component average) and participants were asked to comment on their results. Quantitative result inclusion into the interview allowed for participant response to expand, explore and explain their technology readiness. Given the interview timing in relation to collection of the TRI data, data from the survey had not yet been fully analysed at the time the interviews occurred. The interview schedule was pre-tested with two nurse academics to check for clarity, interview length, appropriate questions and topic order.

3.5.3 Phase two sampling

A survey item was designed to allow participants to indicate their intention to be part of an interview. By selecting this item, participants were given the option to leave contact details, allowing the researcher to make contact. A total of 102 participants indicated that they would be prepared to be part of the interview, of whom 98 left contact information. The researcher used the real time average score of TRI components (optimism, innovativeness, discomfort and insecurity) which were then used to purposively sample for the interviews, with the aim of interviewing a diverse range of participants based on their component results. From this, 66 participants were contacted to check availability and intention to interview. Interviews were conducted until data saturation was reached, which occurred at 18 interviews (Mason, 2010).

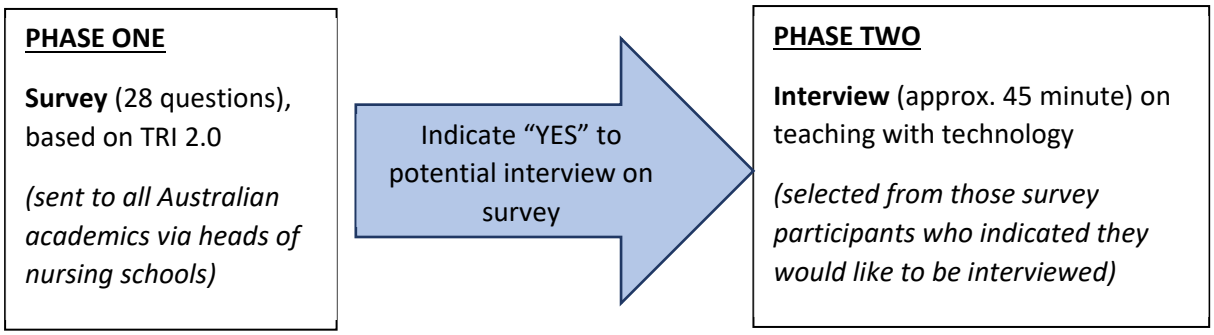

Figure 3.2 Participant Journey

The purposive sampling employed was considered successful as the final sample of 18 participants represented the survey data and contained individuals who belonged to the three main TR groups represented in the survey, namely; Explorers, Sceptics and Hesitators.

3.5.4 Procedure - Interviews

As previously stated, participants indicated on their survey whether they would like to be interviewed, and in doing so, were given the option to leave contact details. Potential participants were then contacted via email by the researcher and invited to an interview with an attached explanation form (Appendix I and Appendix J respectively). Once an interview had been scheduled, an explanatory statement and written consent form were sent to the potential participant (Appendix K). The explanatory statement contained; a research description, what participation would entail, and that the interview would be confidential, including research team contact details. In addition to this, the plain language statement was also attached (Appendix G).

When potential participants contacted the researcher, a time and meeting venue were agreed upon that were mutually suitable to both participant and researcher. The interviews were conducted primarily via Skype due to interviewees being located across Australia

(although two interviews were conducted in person). A private setting was used to ensure confidentiality during in person and online interviews.

The interviews began with introductions and brief research overview and their role. Verbal consent was also gained before the interview began to confirm the written consent of the participants. The importance of participation was emphasised, as was the interview's semi-structured nature. The one-hour maximum expected interview time was relayed, and participants were reminded that the interviews were audio-recorded. A notepad was used to take notes about ideas and information that the interviewer may have wanted to return to, as well as details about the interview venue, date and time and the participant. Part of the preparatory notes was the real-time calculated average score of the participant's components (optimism, innovativeness, discomfort, insecurity), as this was used to guide questions.

The researcher intended to cease conducting interviews once data saturation had been reached. Mason (2010) indicates that saturation is hard to define and sample groups vary significantly according to qualitative design. However, saturation is generally when there is no new data emerging that has an impact on the overall story, model, theory or framework (Mason, 2010). Further to this, Fusch and Ness (2015) suggest that the data should be both thick and rich at the point of data saturation, defining 'thick' as having enough quantity, and 'rich' as being layered, detailed and nuanced data. By reviewing the session notes at the conclusion of each interview, the researcher noted no "new" ideas at approximately the fifteenth interview (Mason, 2010). The interviews had also given rich data and were from a variety of TR groups. Three additional interviews had been scheduled at that time and the researcher chose to conduct these to ensure saturation had been reached. The remaining interviews presented nothing new that would impact on the research findings, and as such, data saturation was deemed to have been reached (Mason, 2010). During thematic analysis of the transcribed interviews, no new themes were apparent at a similar point, confirming the researcher's belief that saturation had been attained.

3.5.5 Qualitative data preparation

Audio-recordings from the interviews were saved to the researcher's secure laptop and a backup kept on a secure cloud service. Files were labelled only with interviewee initials to assist in participant identification (all other information was kept in a secure document separately from the audio file but on the same laptop) to protect participants' confidentiality. From 18 interviews, five recordings were sent to be professionally transcribed to reduce the time taken to ascertain transcripts for coding within postgraduate funding. Thirteen remaining interviews were transcribed using Microsoft Word® by the researcher. Professionally transcribed recordings were listened to again while following along with the transcription to ensure accuracy of the transcription and to ensure the researcher was fully immersed in the interviews. In addition, listening to the transcribed audio-recordings allowed the researcher to confirm accuracy of transcripts before data analysis.

3.5.6 Qualitative analysis

Several analysis methods were considered for the qualitative data. They included grounded theory, content and thematic analysis. What follows is a discussion of each approach and rationale for using the chosen analysis.

Grounded theory-based analysis is a research design or method concerned with the generation of theory, which is 'grounded' in data that has been systematically collected and analysed. It is used to uncover such things as social relationships and behaviours of groups, known as 'social processes'. Grounded theory is a systematic set of techniques and procedures that enable researchers to identify concepts and build theory from qualitative data (Corbin & Strauss, 2015). It is primarily concerned with the psycho-social processes of behaviour and seeks to identify and explain how and why people behave in certain ways (Charmaz, 2014; Corbin & Strauss, 2015). However, the survey data required an explanatory model that enabled flexibility to explore the results of the participant survey. It

was generalised to a phenomenon of technology, but this phenomenon is not tightly defined. In addition, grounded theory requires skilled researchers in the area and also lacks a framework for creating categories (Olesen, 2007). As such, grounded theory was not seen as an appropriate method for this study.

Content analysis was also considered as a method of data analysis. Content analysis is a systematic coding process that categorises textual information to determine trends, frequency of use, relationships and the pattern of communication (Vaismoradi et al., 2013). It can be used in exploratory work to report common issues mentioned in the data. However, content analysis can miss significant meanings if it is focussed only on the frequency of codes, rather than the context in which they occur (Vaismoradi et al., 2013). This can lead to meaning being lost from the context of the data. The focus of content analysis can be either latent meaning or manifest text, whereas thematic analysis has an ability to consider both (Vaismoradi et al., 2013). The context of the data being collected is important in this analysis and, as such, content analysis was used in phase one but not in phase two analysis. Thematic analysis has been defined as a process of interpretation of qualitative data in order to find patterns of meaning across the data (Crowe et al., 2015). In this study, thematic analysis was used to identify, analyse and report patterns (themes) within data (Braun & Clarke, 2006). It allowed for data to be minimally organised and described in rich detail. Braun and Clarke (2006) consider theoretical analysis methods are to be essentially independent of theory and epistemology and, as such, can be applied across a range of theoretical and epistemological approaches, allowing this method of analysis to be used for this study. Thematic analysis was chosen as it would allow the voices of the participants to be clear and allow for explanations around why they used ‘technology in teaching’ to be explored, which fit the research objective. The next section will consider thematic analysis in more detail.

The thematic analysis approach applied in this study was inductive. Braun and Clarke (2006) describe this approach as “bottom-up”, where the process is to code the data without

attempting to fit it into a pre-existing coding frame. The themes maintain strong links to the data. In this way, the analysis is data driven to the point where themes may bear little resemblance to the questions that were originally asked of participants during data collection. As this study was explanatory, this approach allowed for explanation and expansion of data collected in phase one.

A further decision required when using thematic analysis is the level at which the themes are to be identified: latent or interpretive level or semantic or explicit level (Braun & Clarke, 2006). The latent level was chosen for this study. The interviews, while focusing on individual experiences, were likely to reveal themes emerging across the data and have themes that apply to technology in general, rather than specific technology (unless ubiquitous, such as email or learning management systems). Data analysis at the latent level requires some interpretive work and themes are not just descriptive but based on meaning from the data. Braun and Clarke (2006) describe six steps in order to perform thematic data analysis. The steps and their application in this research are outlined below:

Step One: Familiarisation with the data: In this step, the data were transcribed into Microsoft Word®. Transcriptions were uploaded into NVivo® and each reviewed in NVivo® while listening to the original audio-recording to ensure the transcript was correct. Each interview was also printed in hard copy and read several times. Hard copies of interviews were then shredded for confidentiality. Initial concepts and codes were noted in a coding journal.

Step Two: Initial coding: In this step, features of interest among participants' statements were coded using NVivo®, across all interviews. Codes were applied to excerpts and tagged. A coding journal noted decisions made regarding creation of codes, descriptions of codes, when codes were collapsed, tensions within codes and researcher's thoughts and reactions regarding each transcript.

Step Three: Identification of themes: During this step, codes were compared and contrasted. Some codes were combined into single codes, whereas others were discarded or recoded into other codes. All decisions regarding codes were recorded in the coding journal. Similar

codes were then grouped. The researcher looked for broad themes that described the essence of the codes. Codes that demonstrated similarity were grouped into temporary themes and sub-themes for review in the next step.

Step Four: Reviewing of themes (and sub-themes): Initial themes were checked against excerpts within each theme and between themes. Patton (2014) has dual criteria for judging categories: internal homogeneity and external heterogeneity. This means data within each theme should have meaningful similarities, while between the themes, there should be clear and identifiable distinctions (Patton, 2014). During this phase, changes were made to sub-themes if they were unable to demonstrate meaningful coherence within the sub-theme and distinct differences between the sub-themes. Once the themes and sub-themes had been reviewed, the entire dataset was re-read to ascertain if the themes worked in relation to the data set and to code any additional data missed in earlier coding. An initial thematic map was created of the themes and sub-themes.

Step Five: Defining and naming themes: Themes emerging during the thematic analysis were named, and the ‘essence’ of what each theme represented was defined. Themes were further refined, and the data extracts reviewed and organised into a coherent narrative. For each theme and sub-theme, a detailed analysis was written to convey the ‘story’ of each theme.

Step Six: Producing the report: The report includes demographic data from the interviewees’ surveys (grouped for confidentiality) and final narrative of the themes and sub-themes. Evidence of the themes and sub-themes within the data is supported by the excerpts provided. The final report can be seen in the qualitative results of chapter five.

A second reviewer/supervisor (L.M. PhD, with extensive publishing and research expertise in nursing educational research) independently undertook steps two to six and met with the researcher to compare and further refine final themes. This was done to increase integrity of

the analysis. The next section will discuss further efforts the research made to ensure qualitative rigour.

3.5.7 Qualitative rigour

Essential characteristics of qualitative rigour have been described by Koch (2006), as credibility, transferability and dependability. This research addressed each characteristic as follows:

Credibility relates to the way in which data were interpreted. Qualitative research is an interpretive process, however, interpretations need to be substantiated or supported (Crowe et al., 2015, p. 6). Credibility was established in several ways: providing a rationale for each theme, having participants 'member check' a summary of their interview and a second reviewer independently verifying the themes. Each theme deduced from the thematic analysis was supported by both the process as outlined by Braun and Clarke (2006) and the verbatim extracts (presented in the results) that substantiate each theme. A thematic summary (summary of the extracts and themes attached within the interview), was sent to each participant for member checking (See Appendix L for example of the email and participant summary). No participant requested any changes, indicating they felt that the thematic summary was an accurate representation of the interview. An experienced researcher (L.M.) undertook independent thematic data analysis. The researcher and L.M. met to review and discuss the themes. There was general agreement on the themes, with modifications being rewording or refining themes.

Transferability involves providing the reader with sufficient information in order for them to assess similarities or differences between the context in which the study was conducted and their own setting (Crowe et al., 2015, p. 6). This research had open and transparent methods and 'thick description', in which contextual details allow readers to understand the circumstances and context of the data collection. The detailed discussion of the research

methods in this chapter set the context and demonstrate how the researcher gathered and analysed data. Similar studies would compare to the detailed descriptions herein. This was further enhanced by the taking of field notes and a coding journal (Ponterotto, 2006). Field notes were kept during the entire process of the research, including creation of the survey and interview schedule, selection of participants, conduction of the interview and data analysis process. This allowed the researcher to review and justify decisions and allowed for comparison to other settings or studies.

Dependability involves providing sufficient information on both data collection and analysis processes to enable the decision-making trail to be followed (Crowe et al., 2015). To achieve this, a clear data analysis framework was used (discussed above), the processes of data collection and data analysis have been made evident in this research and a comprehensive audit trail was kept in the form of field notes and a coding journal. The decision-making process of selecting the kind of analysis and nuances of the analysis (such as deductive vs inductive) have been discussed in detail in this chapter. The thematic analysis process of Braun and Clarke (2006) has been discussed and its application to this research demonstrated. Additional processes, such as member checking and co-researcher review of the thematic process, have also been discussed.

3.6 Data Management

Data generated from each survey and interview were securely stored on an encrypted, password-protected laptop with a backup copy on an encrypted password protected, University-endorsed corporate cloud storage; OneDrive. Once data analysis was complete, all data from phases one and two were stored and de-identified to maintain confidentiality. All data from the project will be kept for five years after study completion, at which point they will be securely destroyed.

A modified de-identified survey data (with only those parts necessary for TRI interpretation) was sent to the Rockbridge Company based in the United States of America to run proprietary algorithms on the data to generate the TR groups discussed previously. Datasets were securely returned, and Rockbridge does not retain any data. Modification of the dataset sent to Rockbridge removed all identifying demographic data and only contained participants' random identification numbers and associated TRI results.

3.7 Ethical Considerations

The study was identified as posing negligible risk, using the National Statement on Ethical Conduct in Human Research 2018 update guidelines (National Health Medical Research Council et al., 2007 (updated 2018)). It was also identified as posing negligible risk according to the Federation University HREC Risk Assessment Checklist. An ethics application was approved from the 26th of June 2018 until the 31st of December 2021 (see page xiii).

The study was designed so that participants were only inconvenienced by participation and was conducted within the guidelines set out by the National Statement on Ethical Conduct in Human Research (National Health Medical Research Council et al., 2007 (updated 2018)) and reflects the values of autonomy, beneficence and non-maleficence, and confidentiality and privacy.

Autonomy pertains to the idea of respecting an individual to make informed decisions about themselves and their affairs (Shamoo & Resnik, 2009). Autonomy was addressed through informed consent, ability to withdraw consent and no coercion. In phase one, information related to the survey was included in a plain language statement so that participants were fully informed of the survey intention and cost to the individual. Consent to participate was implied by survey completion. In addition, the survey contained a short introduction at the beginning reiterating that participation was voluntary, and participants were free to withdraw

at any time up until the data were de-identified and aggregated. In phase two, participants who selected to be interviewed were given further information about phase two before being asked to provide consent for the interview. No identifiable reports or records were kept once interviews and thematic analysis had concluded. In addition, the interview procedure included verbal information, reaffirming consent to the interview and to the interview being recorded. Member checking allowed the participants to correct any recorded sections they felt were incorrect or that had misrepresented them.

Beneficence is the concept that the research output should provide some benefit to or promote the interests of participants (Shamoo & Resnik, 2009). Non-maleficence is the concept to “do no harm”, that is, the research should aim to minimise the risks of harm or discomfort to participants (National Health Medical Research Council et al., 2007 (updated 2018)). There was no guarantee of direct benefit to the participant in phases one or two, however, it was proposed that the research would provide evidence and effect change in nurse education which may directly benefit participants. The harm to participants was determined to be little more than inconvenience. The survey in phase one was designed to be short, yet effective, further reducing inconvenience. During phase two, interviews were scheduled according to participant availability and convenience. Participants were able to cease the interview and withdraw consent at any point prior to data de-identification. Researcher and support services contact details (for example, Lifeline) were included to provide support if the interview caused distress.

The researchers considered the definition of informational privacy put forward by Leino-Kilpi et al. (2001, p. 666): “an individual's right to determine how, when, and to what extent information about the self will be released to another person or to an organisation”. Confidentiality is the requirement of the researcher to keep such information from being disclosed or from unauthorised access (Leino-Kilpi et al., 2001). In phase one, participants could participate in the survey without disclosing their details, thereby maintaining anonymity. Contact details were only requested once the participant had indicated their intent to be interviewed. Participants’ contact details from the survey were kept securely and

removed once phase two was completed. In phase two, privacy was maintained for interviews by using a private room for both in-person and online interviews. Data related to the interview is kept securely on a password protected computer, including recordings, transcripts and analysis. The final interview report uses pseudonyms, and identifying data (such as institute or course names) are removed.

3.8 Conclusion

A discussion of the overall methodology and research design decisions was provided in this chapter. The philosophy of pragmatism was chosen for this research and this was discussed in detail. The decision to use a mixed methods research design was influenced by the nature of the research question and capacity of the method to provide both quantitative breadth and qualitative depth of understandings of the research objectives.

A mixed methods sequential explanatory design was chosen and key decisions and rationales about sequence, priority and integration of the phases have been discussed. Sampling methods, procedures, data collection and data analysis for phase one and phase two of the study have been described in detail. The next two chapters provide detailed results from phases one (survey) and two (interviews).

Chapter 4. Phase One: Quantitative Results

4.1 Introduction

The previous chapter included a detailed description of the methodology and design of the research. The research objectives were addressed through a mixed methods design comprising two phases of data collection. The results of the survey (quantitative) and interviews (qualitative) strand phases are presented in two separate chapters. This chapter presents the results from the Technology Readiness Index 2.0 (TRI 2) Survey. Presented here are participant demographics, TRI analysis, associations between demographic characteristics (such as gender or age) and TRI scores or associations between segmental groups (a function of the domains used for the TRI score) and demographic characteristics.

Unless otherwise stated, the distribution of each analysis was found to be normal as assessed by Shapiro-Wilk's test ($p > .05$), and there was homogeneity of variances, as assessed by Levene's test for equality of variances ($p > .05$). Outliers from each analysis were examined for errors and the author concluded that the results were genuine in each case. Outliers have been included in the statistical testing as exclusion did not change outcomes. A linear regression comparing the model with and without outliers found that there was no significant difference between the two models (R2 change = -.001, F (1, 157) = 5.054, p=.672).

4.2 Participant Demographics and Descriptive Statistics

The survey sample included nurse academics from higher education institutes, who taught (or had taught) on an undergraduate nursing degree program. The survey was sent to participants primarily by each institute's Head or Dean of Nursing School. The total number of valid responses was 186 from 197 responses. The response rate, based on an approximation of 1,000 nurse academics, was 18.4%. However, the number of staff who were sent the email is unclear, so the response rate may be higher or lower due to this. The

11 responses excluded had entire incomplete sections of the survey (e.g. all demographic questions), making these responses invalid. Missing data were excluded pairwise in each analysis.

4.2.1 Demographics of the participants

The first section of the survey included eight demographic questions regarding: gender, age, nursing practice background, number of years practising as a registered nurse, current highest qualification, current academic position, number of years teaching at an institute and which institute they currently taught at. Three technology-related questions were also included prior to the TRI section of the survey to explore what types of elearning technology participants used, how frequently they engaged with elearning and a self-rating of confidence with elearning (see Appendix E for survey questions). Table 4.1 summarises the results of the participant demographics.

Table 4.1 – Participant Demographics

		n	Percentage
Gender (*n* = 185)	Male	28	15.1
	Female	157	84.9
Age (years) (*n* = 183)	25 - 29	3	1.6
	30 - 34	10	5.5
	35 - 39	11	6.0
	40 - 44	21	11.5
	45 - 49	41	22.4
	50 - 54	33	18.0
	55 - 59	36	19.7
	60 - 64	23	12.6
	65 - 69	5	2.7
Years as RN (*n* = 179)	5-9	9	5.0
	10-14	19	10.6
	15-19	19	10.6
	20-24	24	13.4
	25-29	40	22.3
	30 or more	68	38.0
Years at institute (*n* = 185)	0-1	11	5.90
	2-3	17	9.20
	4-5	27	14.60
	5-9	35	18.9
	10-14	53	28.6
	15-19	22	11.9
	20-24	7	3.8
	25 or more	13	7.0
Qualification (*n* = 186)	Bachelor degree	2	1.1
	Graduate Certificate	9	4.8
	Honours	3	1.6
	Master's	88	47.3
	PhD	84	45.2
Position (*n* = 186)	Associate Lecturer	12	6.5
	Lecturer	118	63.4
	Senior Lecturer	35	18.8
	Associate Professor	9	4.8
	Professor	12	6.5

Participants identified their ages in the survey using five-year groupings. The results demonstrate the highest proportion of academics were clustered within the 40 to 60 years grouping. This is comparable to the National Health Workforce Dataset (NHWD) of those working in a tertiary educational facility, of which 32.6% were in the age range of 45-54 years, and 27.1% were in the age range of 55-64 years, indicating that this sample is representative of the larger population (Australian Institute of Health and Welfare [AIHW], 2019). The age groups were recoded as the average of each group (e.g. 45 to 49 was recoded to the midpoint 47), to allow for statistical analysis of the mean and standard deviation. The recoded ages determined the average age of participants to be 50.1 years (*SD* = 9.1).

Participants identified their years of nursing experience within five-year groups. The number of participants in each grouping increased in line with years of experience. No participants identified having only 0-4 years of nursing experience. The years of experience indicate that the sample represents academics with significant nursing experience, which may have influenced their view of technology and its use.

Participants were asked to indicate their highest qualification achieved. PhD and Master's degrees accounted for over 90% of all qualifications. The remaining participants identified as having either a bachelor degree (*n* = 2), graduate certificate (*n* = 9) or honours degree (*n* = 3). This result is due to the institutional requirement of nurse academics to hold postgraduate qualifications or be working towards them, as part of their employment. Education status is a known influence on TRI, with Parasuraman (2000) noting that college graduates have higher TRI scores compared to those without degrees.

The academic position of Lecturer was the most common position held by participants (63.4%, *n* = 118). Senior Lecturer was the next most common position (18.8%, *n* = 35). The academic positions of Associate Lecturer, Associate Professor and Professor each comprised less than seven percent. This indicates that the sample included academics who had recent teaching experience and were more junior in the institutional hierarchy.

The total years teaching in higher education indicated that a large portion of participants were relatively new to teaching, with 29.7% reporting teaching in institutes between 0-5 years (*n* = 55), followed by teaching experience of 4 and 5 years (*n* = 27) and 10-14 years 28.6% (*n* = 53). This implies that two thirds of the sample had more than five years teaching experience and that participants would be likely to have some experience with the use of teaching technologies. The years working at a higher education institute is likely linked to years nursing as there is an expectation that academics in nursing have clinical experience.

The findings demonstrated that participants came from a wide variety of clinical nursing backgrounds. The largest portion identified as being from intensive care (17.6%, *n* = 32), followed by emergency and medical-surgical backgrounds (both were 12.1%, *n* = 22). A portion of participants selected 'Other' (13.2%, *n* = 24), however, few (*n* = 5) described their backgrounds in the textbox listed within the survey. The backgrounds given within the textbox included infection control, epidemiology, chronic illness, acute nursing and rural/remote nursing.

The institute where participants taught represented 28 of the 36 possible institutes currently accredited to teach the Bachelor of Nursing in Australia at that time (2019). Most institutes (over 70%, *n* = 26) had two or more valid survey responses. The number of respondents generally ranged from one to nine. However, several institutes had larger response rates, for example, the four largest institute responses had 26, 16, 14 and 14 (total of 70) representing 38.9% of the sample. The overrepresentation of these institutes may have biased the results due to the particulars of the institute, for example, technical support or culture.

4.2.2 Descriptive statistics

Participants were asked to identify technology-based elearning practices they currently used or were familiar with in their teaching. Some elearning practices were frequently selected, such as Microsoft PowerPoint, indicating the near universal use of this technology. As previously discussed in the methodology section, the sum of elearning activities was determined as the most instructive measure, that is, a count of the elearning activities the participants selected. This resulted in a cumulative count of the elearning activities for each participant being the outcome measured from this question. The mean of elearning activities was 10.61 (*SD* = 2.86) with range from 2 to 17. As Figure 4.1 shows, there was a high level of engagement in elearning activities, indicating that respondents were quite familiar with employing various elearning activities in their teaching.

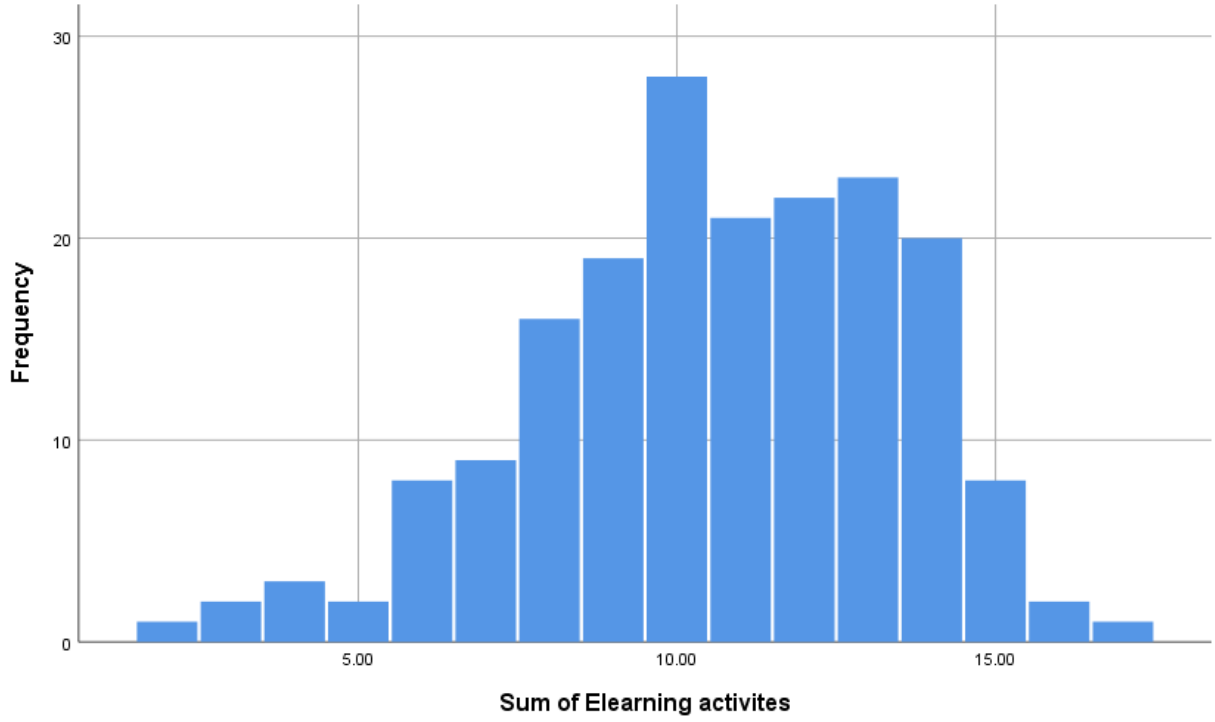

Figure 4.1 Distribution of the number of elearning activities

Participants were asked to identify the frequency in which they engaged with elearning. This was found to be high, with more than 92% (*n* = 172) reportedly engaging with elearning at least weekly, while none selected an option of less than monthly. The high frequency may be due to an employment environment where elearning has come to be expected.

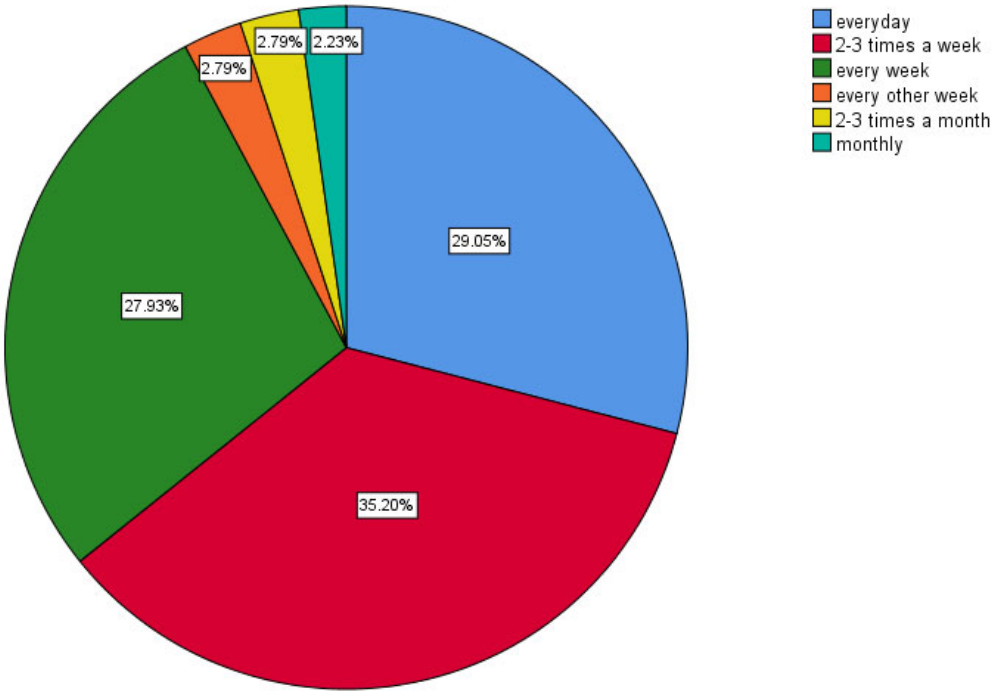

Figure 4.2 Frequency of elearning engagement

Participants were asked to rate their agreement with the statement*: I am confident engaging with teaching through elearning*, on a five-point Likert scale. Overall, agreement with this statement was over 70% (*n* = 133). This indicates that a large proportion of the participants were confident teaching with elearning and the technology used in elearning.

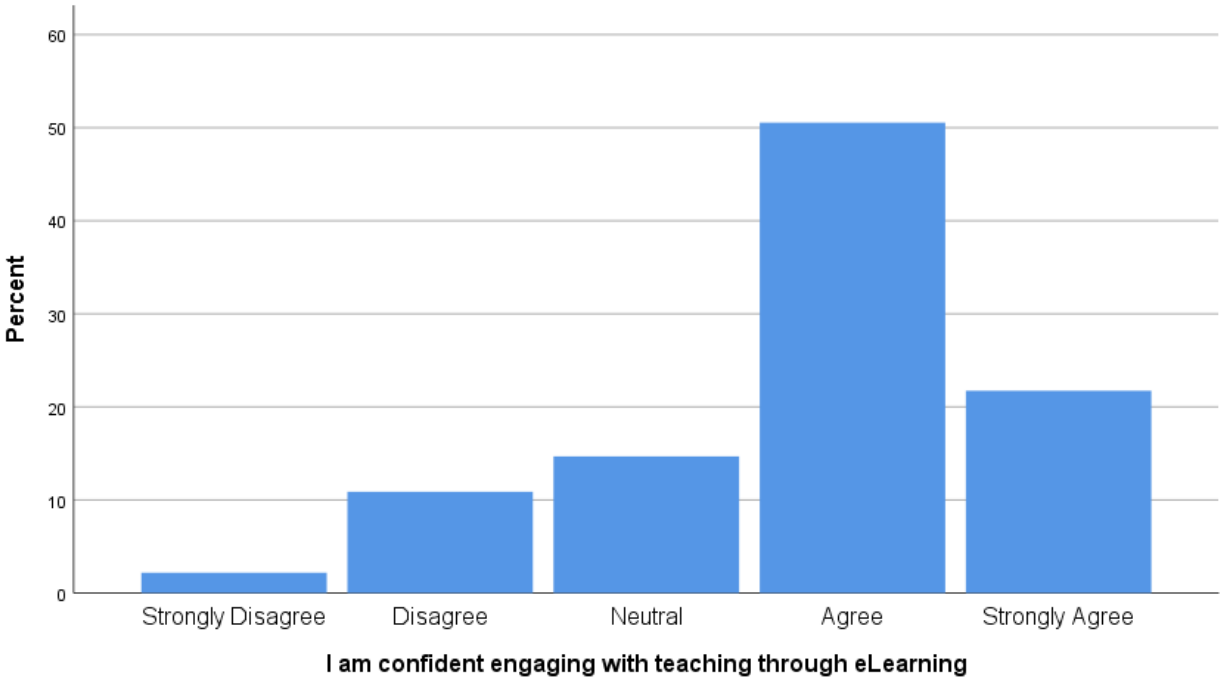

Figure 4.3 Self assessed elearning confidence

4.3 Analysis of TRI 2.0

The Technology Readiness Index 2.0 (TRI 2) is a validated and reliable tool that was used to assess participants' attitudes to technology (Parasuraman & Colby, 2015). In total, 183 valid responses to the TRI 2 survey were completed over the period from September 2018 to January 2019, with an estimated response rate of 18.9%.

Survey results were compared to the previous findings of the TRI authors (Parasuraman & Colby, 2015) and the company (Rockbridge Inc) who conducted a National Technology Readiness Survey (NTRS) using TRI 2 in 2014. The NTRS was an online survey of 784 participants from the United States, comprising adults aged 18 years and older. It is designed to be a random sample that is representative of the general population. The NTRS is considered a baseline for comparison for this section, as previous research with academics (Duvall, 2012; Panday & Purba, 2015) and university nursing students (Caison et al., 2008; Kuo et al., 2013; Odlum, 2016) had used the earlier TRI 1.0 model, rather than the TRI 2 used in this study.

4.3.1 Validity and reliability

Validity and reliability of the TRI 2 has already been conclusively tested by Parasuraman and Colby (2015). However, validity and reliability testing for the current study was performed. This included Cronbach alpha, principal component analysis and face validity as discussed in detail below.

4.3.2 Internal consistency/reliability (Cronbach's Alpha)

The survey results for the constructs, Optimism, Innovativeness, Discomfort and Insecurity, each consisted of four questions. Internal consistency across the two enablers, Optimism and Innovativeness, was high, determined by Cronbach alpha levels of 0.75 and 0.82 respectively. The two inhibitors also had high internal consistency with a Cronbach alpha for

Discomfort of 0.77 and for Insecurity 0.75. All Cronbach alpha levels were higher than the recommended value of 0.7, indicating internal consistency (Kline, 2005). Parasuraman and Colby (2015) found Cronbach alpha scores of: Optimism 0.8, Innovativeness 0.83, Discomfort 0.70 and Insecurity 0.71, which are closely aligned to the findings of the current study.

4.3.3 Principal Component Analysis

Principal component analysis (PCA) was run on the TRI 2 in the 183 completed surveys. The suitability of PCA was assessed prior to analysis. Inspection of the correlation matrix showed that all variables had at least one correlation coefficient greater than 0.4. The overall Kaiser-Meyer-Olkin (KMO) measure was 0.84. Bartlett's test of sphericity was statistically significant ($p < 0.001$), indicating that the data was likely factorisable.

PCA revealed four components that had eigenvalues greater than one and which explained 32%, 11.8%, 10% and 8.1% of the total variance, respectively. Visual inspection of the scree plot indicated that four components should be retained (Cattell, 1966). In addition, a four-component solution met the interpretability criterion. As such, four components were retained.

The four-component solution explained 61.9% of the total variance. Varimax orthogonal rotation was employed to simplify loadings and aid interpretability. A summary of the components of factors is in Table 4.2. The rotated solution exhibited 'simple structure' (Thurstone, 1947). Interpretation of data was consistent with the personality attributes the questionnaire was designed to measure, with loadings of Optimism items on Component 1, Innovativeness items on Component 2, Discomfort items on Component 3 and Insecurity items on Component 4. There was one exception, (INS4: I do not feel confident doing business with a place that can only be reached online), which loaded on both insecurity and discomfort, however, this also occurred in the Parasuraman and Colby (2015) study. The

loading is still within the overall inhibitor components (Discomfort and Insecurity). Parasuraman and Colby (2015) suggest that this could be due to the fact that although Optimism and Innovativeness are innate traits and easily measured, Insecurity and Discomfort, are more complex. Component loadings and communalities of the rotated solution are presented in Table 4.3.

Table 4.2 – Summary of the component of factors from TRI 2.0

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.122	32.01	32.01	5.122	32.01	32.01	3.336
2	1.888	11.801	43.811	1.888	11.801	43.811	3.214
3	1.597	9.984	53.794	1.597	9.984	53.794	3.285
4	1.297	8.107	61.901	1.297	8.107	61.901	3.008
5	0.843	5.27	67.172				
6	0.777	4.859	72.03				
7	0.606	3.789	75.819				
8	0.573	3.58	79.399				
9	0.539	3.366	82.765				
10	0.497	3.106	85.871				
11	0.449	2.806	88.678				
12	0.437	2.731	91.409				
13	0.416	2.599	94.008				
14	0.36	2.251	96.259				
15	0.316	1.975	98.234				
16	0.283	1.766	100				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 4.3 – Component loadings and communalities of the rotated solution for TRI 2.0

Pattern Matrix				
	Component			
	1	2	3	4
OPT3	0.783			
OPT4	0.735			
OPT2	0.729			
OPT1	0.702			
INN2		0.836		
INN1		0.806		
INN3		0.795		
INN4		0.653		
DIS3			0.809	
DIS2			0.777	
DIS4			0.725	
DIS1			0.612	
INS2				0.827
INS1				0.758
INS3				0.746
INS4			0.427	0.475

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalisation.

a. Rotation converged in 8 iterations.

4.3.4 Construct Validity

Construct validity is “the degree to which the test actually measures the underlying unobservable construct it is intended to measure” (Sartori & Pasini, 2007, p. 359). TRI is designed to measure attitude to technology and previously has been found to be associated with number of technologies participant’s own and participant’s engagement with online activities, such as online shopping or streaming music (Parasuraman & Colby, 2015). In this study, frequency of technology use, confidence with technology and number of technologies used, were all associated with TRI score at a statistically significant level (discussed in detail in section 5.3). Associations of frequency of technology use, technology confidence and number of technologies used indicate that the TRI score likely measures participants’

predisposition to use of technology, indicating construct validity for the current use of the survey.

4.3.5 Sample size - Power Analysis

Thirty-six institutes were identified as offering an undergraduate bachelor degree in nursing in Australia. This study aimed to collect 300 surveys by attempting to contact all academics currently employed in institutes. In total, 183 valid responses were obtained despite efforts to increase the sample size as outlined in the methods section and, as such, this is a limitation of this study. Bearing this in mind, and the confidence level of 95%, the margin of error was reconfigured to 6.49% (Daniel, 2009).

The sample size for PCA can be determined by several criteria. Both rule of thumb for individual variables (minimum 5 subjects per variable) and overall sample size (minimum of 100) were met. The statistical criteria of 10 subjects a parameter in which the maximum number of parameters = $k*(k+1)/2$, where k is the number of constructs (4 in this study) in the PCA model, was also met (a required sample size of 100). Therefore, the sample size was sufficient for PCA. Post-hoc power analysis was conducted for each factor of the TRI 2 given the sample size. All four factors had a power above 0.80, which is considered acceptable (Lavrakas, 2008).

Sample size across the statistical testing was reviewed using VanVoorhis and Morgan (2007) Reasonable Sample Size for measuring group differences (t-tests, ANOVA), measuring relationships (correlation) and chi-squared. In addition, normality and homogeneity were tested. If either sample size was too small, alternative statistical testing or re-grouping was used. If normality or homogeneity were violated a non-parametric test was used as appropriate. The use of non-parametric tests reduces the power of the statistical analysis and, as such, is a limitation of this study.

The mean score of the TRI 2 was 3.28 (*SD* = 0.55), with a range of 1.63 to 4.75. For comparison, the NTRS (Parasuraman & Colby, 2015) found that the mean score of the TRI 2 was 3.02 (*SD* = 0.61). This indicates that the nurse academic sample was more likely to adopt technologies, but also, that there was a range of readiness for technology among these academics, as seen in Figure 4.4.

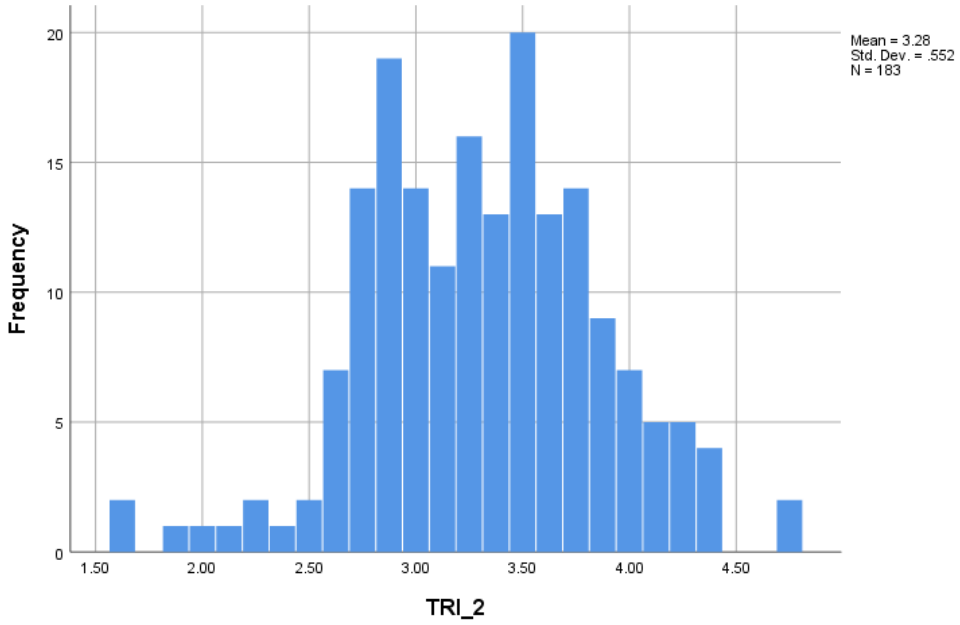

Figure 4.4 Distribution of TRI 2.0

The TRI survey includes four domains: Optimism, Innovativeness, Discomfort and Insecurity. Optimism and Innovativeness are contributors to technology readiness while Discomfort and Insecurity are inhibitors. The four domains were analysed as per Table 4.4 below. For comparison, the NTRS (Parasuraman & Colby, 2015) found the following mean scores; Optimism 3.75 (*SD* = .80), Innovativeness 3.02 (*SD* = 1.02), Discomfort 3.09 (*SD* = .82) and Insecurity 3.58 (*SD* = .83). Of note is that the study sample had lower scores for both inhibitor domains (Discomfort and Insecurity), indicating that the participants of this study had more positive associations with technology than the NTRS sample.

Table 4.4 – The descriptive statistics of TRI Domain analysis

	Mean	n	Minimum	Maximum	Std. Deviation
Optimism	3.750	183	1.25	5.00	.63860
Innovativeness	3.185	183	1.00	5.00	.86857
Discomfort	2.617	183	1.00	5.00	.77576
Insecurity	3.143	183	1.00	5.00	.79914

Rockbridge Inc. ran proprietary analysis on de-identified survey data from this study in order to create groups that indicate the degree of propensity towards, and aversion to technology, based on the four components (discussed in Chapter 3). The author of the survey, Parasuraman (2000), developed a segmentation scheme (using K-means cluster analysis of TRI 1.0 scores) that consisted of five segments:

- Avoiders: tend to have a high degree of resistance and low degree of motivation.
- Hesitators: stand out due to their low degree of innovativeness.
- Sceptics: tend to have a detached view of technology, with less extreme positive and negative beliefs.
- Explorers: tend to have a high degree of motivation and low degree of resistance.
- Pioneers: tend to hold both strong positive and negative views about technology (Parasuraman & Colby, 2015, p. 71).

These segmental groups were discussed in detail in the previous chapter.

Table 4.5 below summarises the results from this survey with comparison to the NTRS results of Parasuraman and Colby (2015). Of note is the larger proportion of participants who were Explorers and Sceptics, while there were fewer Avoiders and Pioneers, while Hesitator groups are similar.

Table 4.5 – Comparison of TRI groups

Group	Frequency	Percent	Comparison (Parasuraman & Colby, 2015)
Sceptic	82	44.8	29.1
Explorer	57	31.1	20
Avoider	9	4.9	17.5
Pioneer	4	2.2	16.5
Hesitator	31	16.9	17.0

4.4 Comparison of survey data to TRI 2.0

TRI scores were compared to survey participants' demographic data. The demographic factors: age, gender, background, years as RN, qualification, current position, years employed in higher education and which institute currently employed with, were shown to have no statistically significant association with TRI. Frequency of technology engagement, number of technologies engaged with and confidence with elearning were shown to have statistically significant associations with TRI 2.0. Further discussion of each demographic against TRI is addressed below.

Age

There was a negligible, negative association between age and TRI score, which was not statistically significant, τb = -.080, p = .141. This indicates that age, although affecting TRI slightly, is not a significant factor in participants' technology readiness.

Gender

There were 26 male and 156 female participants which completed the TRI survey. Male TRI 2.0 score (M = 3.28, SD = 0.63) was slightly lower than female TRI 2.0 score (M = 3.29, SD = 0.54). The results were not statistically significant, $t(180)$ = -.089, p = .929. Gender does not appear to play a role in the technology readiness of the participants, although the small number of male participants may have affected this result.

Background

Kruskal-Wallis H test was run to determine if there were differences in TRI score between the nursing background groups (n = 20) of participants. Distributions of TRI scores were dissimilar for all groups, as assessed by visual inspection of a box plot (see appendix M). The mean rank of TRI scores was not statistically significantly different between groups, χ2(19) = 10.964, p = .925.

Years as RN

There was a weak, negative association between years as RN and TRI score, which was not statistically significant, τb = -.082, p = .148 (n = 177). This indicates that the years of experience as a nurse did not play a role in determining technology readiness.

Qualification

The groups of bachelor, graduate certificate and honours qualifications were collated into a single group called the 'combined group'. This occurred for two reasons – the groups alone were quite small and the groups represented similar levels of qualification, so that they could be grouped together and remain distinct from the Master's degree and PhD groups.

One-way ANOVA was conducted to determine if the TRI score was different for groups with different qualifications. The TRI score was lowest for the combined group (bachelor, graduate certificate, honours, (n = 14, M = 3.15, SD = .65). TRI score for the PhD group was higher (n = 87, M = 3.24, SD = .55) while the Master's group was highest (n = 82, M = 3.34, SD = .54), but the differences between groups were not statistically significant, F(2, 180) = 1.049, p = .352. This indicates that qualification level did not play a statistically significant role in determining technology readiness.

Current position

Current employment position group distributions of TRI score were dissimilar, as assessed by visual inspection of a box plot (see appendix M). Some groups were abnormally distributed. The mean rank of TRI scores was not statistically significantly different between groups, $\chi^2(4) = 1.565$, p = .815. This indicates that the position of the participants did not play a significant role in effecting technology readiness.

Years teaching in higher education

There was no association between years working in higher education and TRI score, which was not statistically significant, τb = -.009, p = .865 (n = 183). This implies that the experience of the participants had no effect on their technology readiness.

Participant institute

Institutes with less than two participants were excluded from analysis due to the inability to perform normality and homogeneity testing. The final number of institutes included for analysis was 16 (9 excluded). Normality and homogeneity were violated.

Distributions of TRI score were dissimilar for all groups, as assessed by visual inspection of a box plot (See appendix M). The mean rank of TRI scores was not statistically significantly different between groups, $\chi^2(16) = 4.625$, p = .995.

Comparisons of institutes belonging to various groups, including Regional Universities Network (a group of universities delivering higher education in rural and regional Australia) $t(181) = -.415$, p = .679, Innovative Research Universities (a group of eight universities committed to inclusive excellence in teaching, learning and research in Australia) $t(181) = .339$, p = .735, universities that offer online BN courses (6 institutes, n=43) $t(181) = -.415$, p = .679, and groupings based on state or territory of the institute (Welch's $F(7, 16.702) = 1.670$, p = .184), also found no significant difference between the varying groups.

The above results suggest that the institute in which the participant was employed had little effect on participants' technology readiness.

4.4.1 Frequency of elearning engagement

There was positive association between frequency of elearning engagement years and TRI score, which was statistically significant, τb = .173, *p* = .003 (*n* = 183). This indicates that higher engagement with elearning was associated with higher technology readiness.

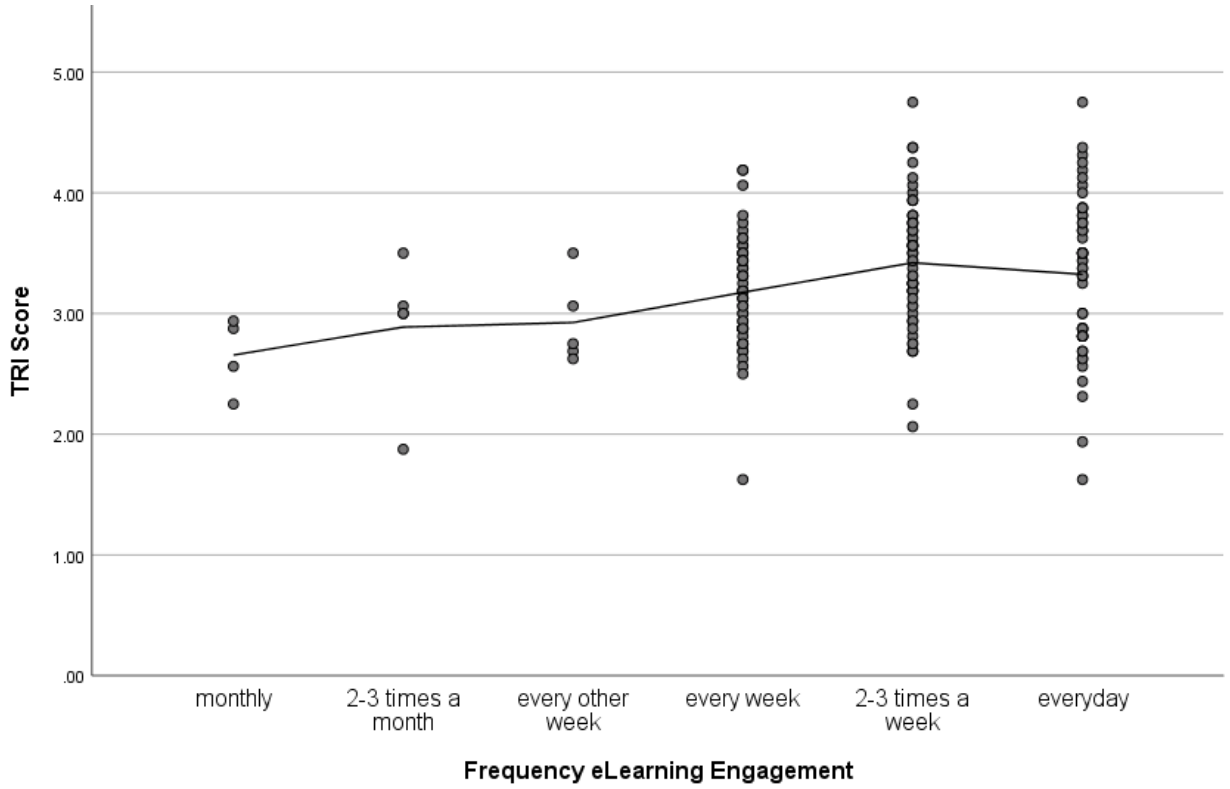

Figure 4.5 Scatterplot of TRI score and frequency of elearning engagement

4.4.2 Number of elearning technologies

There was a weak positive association between the sum of the elearning technologies selected and TRI score, which was statistically significant, τb = .186, $p < .001$ ($n = 183$). The association between technology readiness and elearning activities, means that participants who had higher technology readiness were more likely to have been engaging with more elearning technologies.

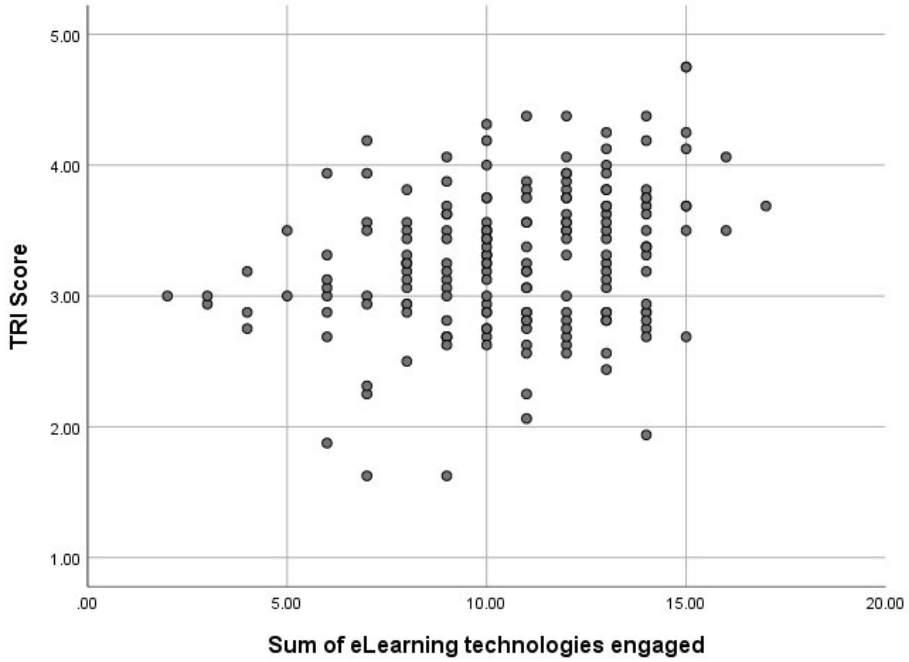

Figure 4.6 Scatterplot of TRI score and Sum of elearning technologies engaged

4.4.3 Confidence

There was a moderate positive association between self-rated confidence with elearning and TRI score, which was statistically significant, τb = .353, $p < .001$ (n =1 83). This indicates that the participants who were more technology ready were more likely to be confident with using elearning in their teaching.

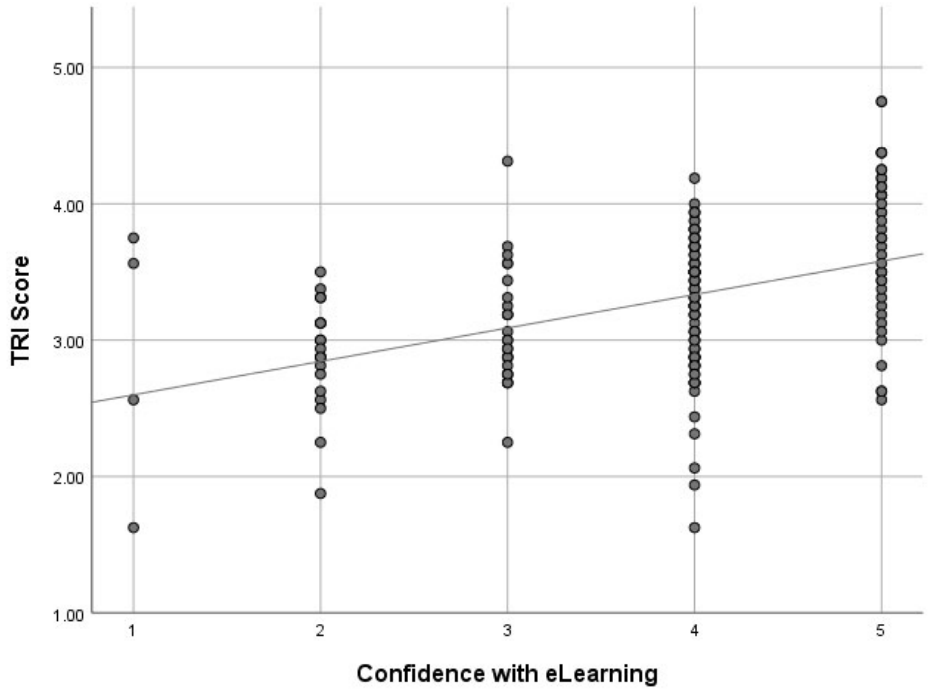

Figure 4.7 Scatterplot of TRI score and confidence with elearning

4.5 Segmental Analysis

The company that owns the TRI survey (Blackrock Inc.) applied a proprietary algorithm to the data, based on the four components the TRI score is composed of (innovativeness, optimism, discomfort, insecurity) to segment the participants into five groups. The five groups (as previously discussed in section 4.2) were: Avoiders, Hesitators, Sceptics, Explorers and Pioneers. The groups will be referred to as Technology Readiness groups (TR groups). The TR groups were used to further analyse the data to identify the effect of demographic data within the groups. Participant institute and background were unable to be analysed due to low participant numbers within each TR group. Distributions were dissimilar for TR groups across many of the variables, as such mean ranks have been reported.

Age

Kruskal-Wallis H test was run to determine if there were differences in age levels between the TR groups. The mean rank of age levels was not statistically significantly different between groups, $\chi^2(4) = 3.398$, $p = .494$. This implies that age is similar across the TR groups.

Years as RN

The mean rank of age levels was not statistically significantly different between groups, $\chi^2(4) = 5.584$, $p = .236$. Distributions of years as RN levels were not similar for all groups, as assessed by visual inspection of a box plot (see appendix M).

Qualification

Kruskal-Wallis H test was run to determine if there were differences in qualification levels between the TR groups. The mean rank of qualification levels was not statistically significantly different between groups, $H(4) = .776$, $p = .942$. This suggests there is no effect of qualification on determining the TR group of the participants.

Current position

The mean rank of current position was not statistically significantly different between groups, $\chi^2(4) = 3.270$, $p = .514$. This indicates that there is no effect on participant TR group by the participant's current employment position.

Years teaching in higher education

Kruskal-Wallis H test was run to determine if there were differences in years teaching at institute levels between the TR groups. The mean rank of age levels was not statistically significantly different between groups, $H(4) = 2.325$, $p = .676$. This indicates that the years teaching in higher education had no effect on the TR grouping of the participants.

4.5.1 Gender

Chi-square test of independence was conducted between TR group and gender. Note that the hesitator, sceptic and avoider TR groups were excluded from analysis due to the low participant numbers in each group. All expected cell frequencies were greater than five.

There was a statistically significant association between TR group and gender, $\chi^2(1) = 4.34$, $p < .001$. The association was small, defined as less than 0.3 but more than 0.1 (VanVoorhis & Morgan, 2007), Cramer's $V = .177$ (Cohen, 1988). Table 4.6 shows the observed frequencies with the adjusted residuals below in parenthesis. Although the difference was small, the findings indicate that males had higher representation in the explorer group, that is, they are more likely to be an 'Explorer'. This suggests that gender may play a role in determining the type of grouping nurse academics belong to.

Table 4.6 – Crosstabulation of TR group and gender with adjusted residuals

	Male	**Female**
Sceptic	7 (-2.1)	74 (2.1)
Explorer	12 (2.1)	45 (-2.1)

4.5.2 Frequency of elearning engagement

Chi-square test of independence was conducted between TR group and frequency of elearning engagement. Note that the hesitator, sceptic and avoider TR groups were excluded from analysis due to the low participant number within the groups. The frequency was collapsed to three variables - everyday, two to three times per week and every week or less. All expected cell frequencies were greater than five.

There was a statistically significant association between TR group and frequency of elearning engagement, $\chi^2(2) = 10.109$, $p = .006$. The association was moderately strong, Cramer's $V = .27$ (Cohen, 1988). Table 4.7 shows the observed frequencies with the adjusted residuals below in parenthesis. The results indicate that sceptics engaged less frequently with technology than explorers. As the characteristics of explorers include being more motivated to engage with technology, this would appear to be associated with increased frequency of elearning engagement.

Table 4.7 – Crosstabulation of TR groups and frequency of elearning engagement with adjusted residuals

	everyday	**2-3 times a week**	**every week or less**
Sceptic	22 (-0.8)	25 (-2.2)	35 (3.1)
Explorer	19 (0.8)	28 (2.2)	10 (-3.1)

4.5.3 Number of elearning technologies

A Kruskal-Wallis H test was run to determine if there were differences in total number of elearning technologies between the five TRI groups. Distributions of number of elearning technologies differed between groups, as assessed by visual inspection of a box plot (see appendix M). The distributions of number of elearning technologies were statistically significantly different between groups, $X^2(4) = 17.342$, $p = .002$.

Subsequently, pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. Adjusted p-values are presented. This post-

hoc analysis revealed statistically significant differences in number of elearning technologies between the Hesitator (mean rank = 71.86) and Explorer (mean rank = 111.18) (p = .008). No significant differences were found between any other group combination. This indicates that TRI group is a factor in how many elearning technologies participants engage with.

Table 4.8 – Number and mean rank of elearning technologies engaged with for TR groups

TR group	n	Mean rank
Sceptic	82	91.6
Explorer	57	111.18
Avoider	9	59
Pioneer	4	58.5
Hesitator	31	71.68

4.5.4 Confidence

Kruskal-Wallis H test was run to determine if there were differences in self-rated confidence with elearning between the TR groups. Participants were asked the level to which they agreed with the statement: “I am confident engaging with teaching through elearning.”, on a five-point Likert scale. The data were abnormally distributed and violated the assumption of homogeneity. See Table 4.9 for mean ranks and n for TR groups in this analysis. Distributions of confidence with elearning differed for all groups, as assessed by visual inspection of a box plot (see appendix M). The mean rank of confidence levels was statistically significantly different between groups, $\chi^2(4) = 13.029$, $p = .011$.

Table 4.9 – Mean rank of confidence with elearning for TR groups

TR group	n	Mean Rank
Sceptic	82	93.19
Explorer	57	117.37
Avoider	9	55.28
Pioneer	4	82.63
Hesitator	31	54.08

Pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. Mean rank and adjusted p-values are presented. This post-hoc analysis revealed statistically significant differences in Confidence scores between the Hesitator (54.08) and Sceptic (93.91, p = .002), the Hesitator (54.08) and Explorer (117.37p < 0.001), the Avoider (55.28) and Explorer (117.37, p = 0.004) and the Sceptic (93.91) and Explorer (117.37, p = 0.043), but not between any other group combination. Figure 4.8 displays the percentage of each TR group and their response to the confidence statement. The results indicate that self-rated confidence with elearning is a key factor within the TR groups. Confidence appears to be a significant factor in the attitudinal position of the participants and may impact engagement of technology through teaching.

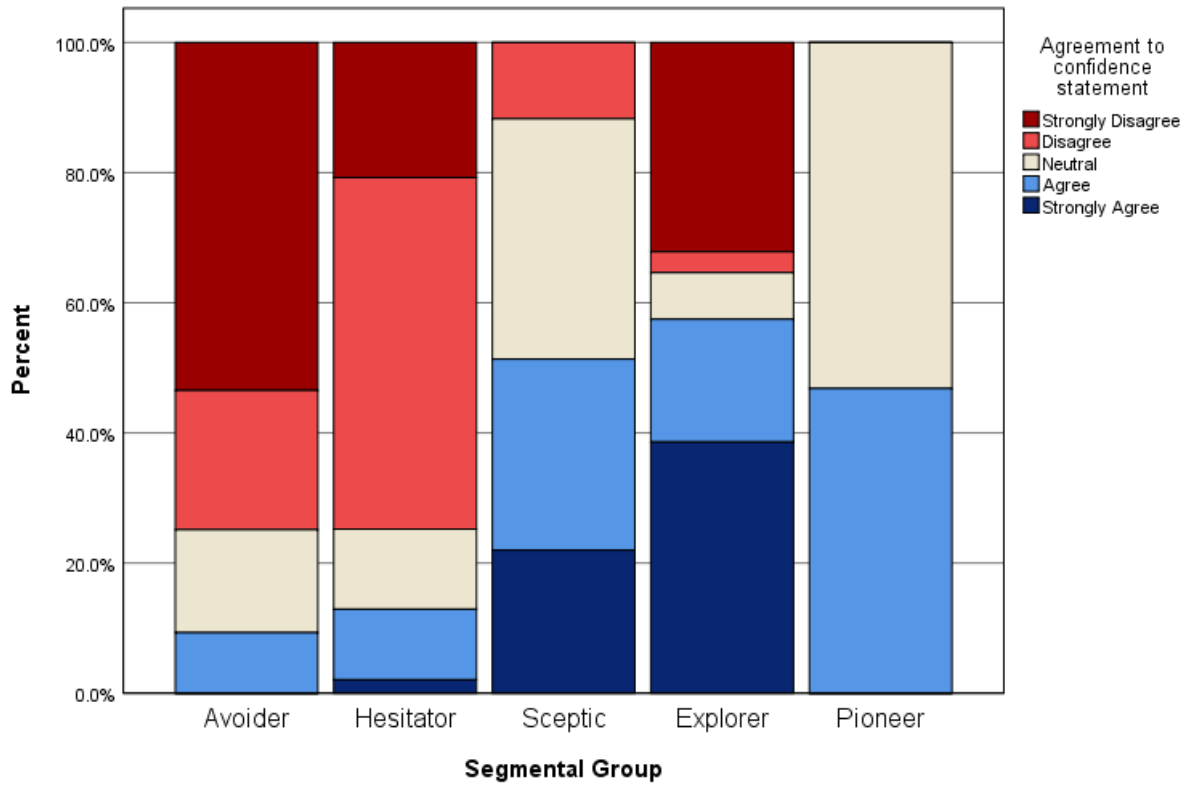

Figure 4.8 Comparison of agreement to confidence statement (“I am confident engaging with teaching through elearning”) by TR group

4.6 Content Analysis

Responses to the open-ended question, “Please add any further comments below”, (*n* = 39) were analysed using content analysis methods described in the methods chapter. The results can be seen the Table below, which includes the rank of the theme as well as the count and percentage of response within that theme. A brief summary of each theme is discussed below.

Table 4.10 – Content analysis of the question “Please add any further comments below”

Ranking	Theme	Count	Percentage
1	Support	11	28.2
2	Interpersonal	9	23.1
3	Technical Skill	9	23.1
4	Time	6	15.4
5	Pedagogy	4	10.3
5	Student benefit	4	10.3

Support was the highest ranked theme from the content analysis. This referred to the need for support, primarily from the institute (although this was not always explicit). This included resources, training and technical support. The participants expressed a need for support to engage with technology. *Interpersonal* relates to the concern that technology may impact the development of interpersonal skills (such as communication). The concern expressed was that technology may interfere or diminish interpersonal skills, which are highly valued in the nursing profession. *Technical skill* referred to primarily the participants’ abilities to use educational technologies, but also included some concern about students’ technical skills. This theme was often related to support, in that the participant identified that they may lack technical skill and that they required support to engage with technologies of teaching. *Time* was a theme that described how participants felt technology required time to engage with.

Technology was referred to as “time consuming” and that the participants lacked the time to engage with technologies for their teaching. *Pedagogy* relates to the pedagogical concerns that technology was overused in teaching. Rather than a total rejection of technology, the participants questioned if technology could achieve the learning outcomes (such as critical thinking) that they desired. Contrasting this theme was *Student benefit*, in which participants expressed that technology could provide a benefit to student learning and create innovative ways of teaching and more engaging teaching.

4.7 Conclusion

This chapter presented the results from phase one of the study, the Technology Readiness Index 2.0 (TRI 2). Overall, demographic aspects of the participants appear to have had little effect on their technology readiness. There is homogeneity across demographic aspects that indicates other factors influence technology readiness. The exception being gender for determining TR group whereby results indicated a statistically significant difference. However, the effect size was small and, for this reason, may not represent a real-world difference. In contrast, the significant findings associated with TRI score were all related directly to technology and technology use itself.

The number of elearning activities that nurse academics engaged with was associated with technology readiness, that is, TRI score increased with the number of technologies that participants identified themselves engaging with. Significant differences were also found between TR groups and number of elearning activities. The Explorer group engaged with more technologies than the Hesitator group. This indicates that readiness may influence the engagement of participants with elearning activities. Either technology readiness increased the propensity of the participant to engage with technologies or engagement with technology increased the technology readiness of the participant.

The frequency that participants engaged with elearning was also associated with technology readiness. Higher TRI scores were associated with more frequent elearning engagement.

The TR group Explorers also engaged with elearning more frequently than the TR group Sceptics. This indicates that readiness impacts how often a nurse academic engages with technology. This could be due to the level of readiness effecting the inclination to engage with elearning technologies, or that more frequent engagement allowed the participant to become increasingly familiar and have a higher readiness score.

The self-rating of confidence with elearning was also positively associated with TRI score. The higher the confidence, the more likely the participant was to have a higher TRI. In addition, significant differences between several TR groups were found. Overall, Hesitator and Avoider groups were more likely to have lower proportions of individuals with low self-rated confidence scores compared with Explorer and Sceptic groups. This indicates that self-rated confidence is a significant factor for technology readiness. Confidence itself might increase technology readiness or technology readiness may influence confidence.

The next chapter further explores the nurse academics and their attitudes to technology by presenting the findings from phase two of this study. Thematic findings of semi-structured interviews with participants in relation to technology and its use in their teaching will be discussed.

Chapter 5. Phase Two: Nurse Academic Interviews Results

5.1 Introduction

The previous chapter reported the results of the quantitative survey from phase one of this study. The results of the qualitative component of phase two (semi-structured interviews) are reported in this chapter. The results are presented in two parts: description of the interview participants and the thematic outcomes from interviews.

Participants and their engagement with technology are discussed throughout this chapter. How they interacted, for what purpose, attitudes and external influences, are considered in order to explain academic engagement with teaching technology. Academic engagement with technology refers to the use, contemplation and requirements in relation to their use of technology in nurse education.

5.2 Interview Participants

A total of 18 semi-structured interviews were conducted between October and December 2019. Participants self-identified their desire to be part of the interview process following the survey and were then invited to an interview. Participants invited to be interviewed were purposively sampled, based on their scores across the four domains of the TRI 2.0 (optimism, innovativeness, discomfort and insecurity), in order to increase the range of participant perspectives, as previously discussed in the methods chapter. Demographic data were collected from the survey which was completed prior to interview, and demographic details were grouped in order to maintain confidentiality (see Table 5.1).

Table 5.1 – Participants' grouped demographic data

		n	%
Age (years)	35 - 39	1	5.6
	40 - 44	2	11.1
	45 - 49	5	27.8
	50 - 54	4	22.2
	55 - 59	3	16.7
	60 - 64	2	11.1
	65 - 69	1	5.6
Gender	M	3	16.7
	F	15	83.3
Years as RN	10 - 14	1	5.6
	15-19	2	11.1
	20-24	4	22.2
	25-29	4	22.2
	30 or more	7	38.9
Highest Qualification	Masters	11	61.1
	PhD	7	38.9
Current Position	Associate Lecturer	1	5.6
	Lecturer	13	72.2
	Senior Lecturer	1	5.6
	Associate Professor	3	16.7
Years teaching at tertiary level	2-3	1	5.6
	4-5	3	16.7
	6-9	2	11.1
	10-14	8	44.4
	15-19	2	11.1
	25 or more	2	11.1
Frequency of elearning engagement	everyday	6	33.3
	2-3 times a week	7	38.9
	every week	5	27.8
Confidence with elearning	Neutral	1	5.6
	Agree	11	61.1
	Strongly Agree	6	33.3
TR Group	Sceptic	7	38.9
	Explorer	9	50.0
	Hesitator	2	11.1

Age

The average age of interviewed participants was 51.4 years (SD = 7.83).

Nursing background

Nursing backgrounds varied. These included: community nursing, emergency, intensive care, medical-surgical, neurology, palliative, renal, mental health and other (not specified).

Higher Education Institute

Participants came from eight different institutes that delivered Bachelor of Nursing courses.

TRI score.

Participants' average TRI 2.0 score was 3.56 (*SD*=0.567) with a range from 2.69 to 4.75. The researcher interviewed a range of participants based on their TRI and component (Optimism, Innovativeness, Discomfort and Insecurity) scores, as discussed in the methodology and methods chapter.

TR groups

TR groups were not available at the time of contacting participants as these were determined through a proprietary algorithm performed by the owners of the TRI 2.0 survey (Rockbridge Inc.). The four domains of TRI (optimism, innovativeness, discomfort and insecurity) are used to create groups based on the comparative levels of each domain. The segmental results show the three main TR groups that were apparent in the survey sample: Explorers, Sceptics and Hesitators (see Table 5.1). This reflects the most common segments of the overall survey sample from Phase one. It should be noted that this grouping was not available at the time of interview or thematic analysis as the data required analysis as mentioned above.

5.3 Thematic analysis outcomes

Four themes emerged from thematic analysis of the interview data: *Purpose of Technology in Teaching, Requirements to Engage with Technology, Attitudes towards Technology,* and *External Influences*. Each theme contained subthemes that developed and explained the

overarching findings. The themes and subthemes emerged from the data following the process described in the methodology and methods chapter. This section discusses each of the themes and subthemes in detail, providing quotes from the data to substantiate the inferences made by the researcher. The quotes are taken directly from the transcripts of the interviews. Pseudonyms were created for each participant and are used in order to maintain participants anonymity.

The themes that arose from this study are interrelated. Figure 5.1 is a model of how the themes interact with one another to impact teaching with technology. Although the nurse academic is at the centre of this model, the influences of the themes can be seen on the nurse academic, both internal and external. The model demonstrates how limitations in one theme has the potential to impact other themes, for example, an issue with *Requirements to Engage with Technology* may impact the *Attitudes towards Technology*. Nurse academics' attitudes to technology do not occur interdependently of other factors and the model in Figure 5.1 demonstrates this.

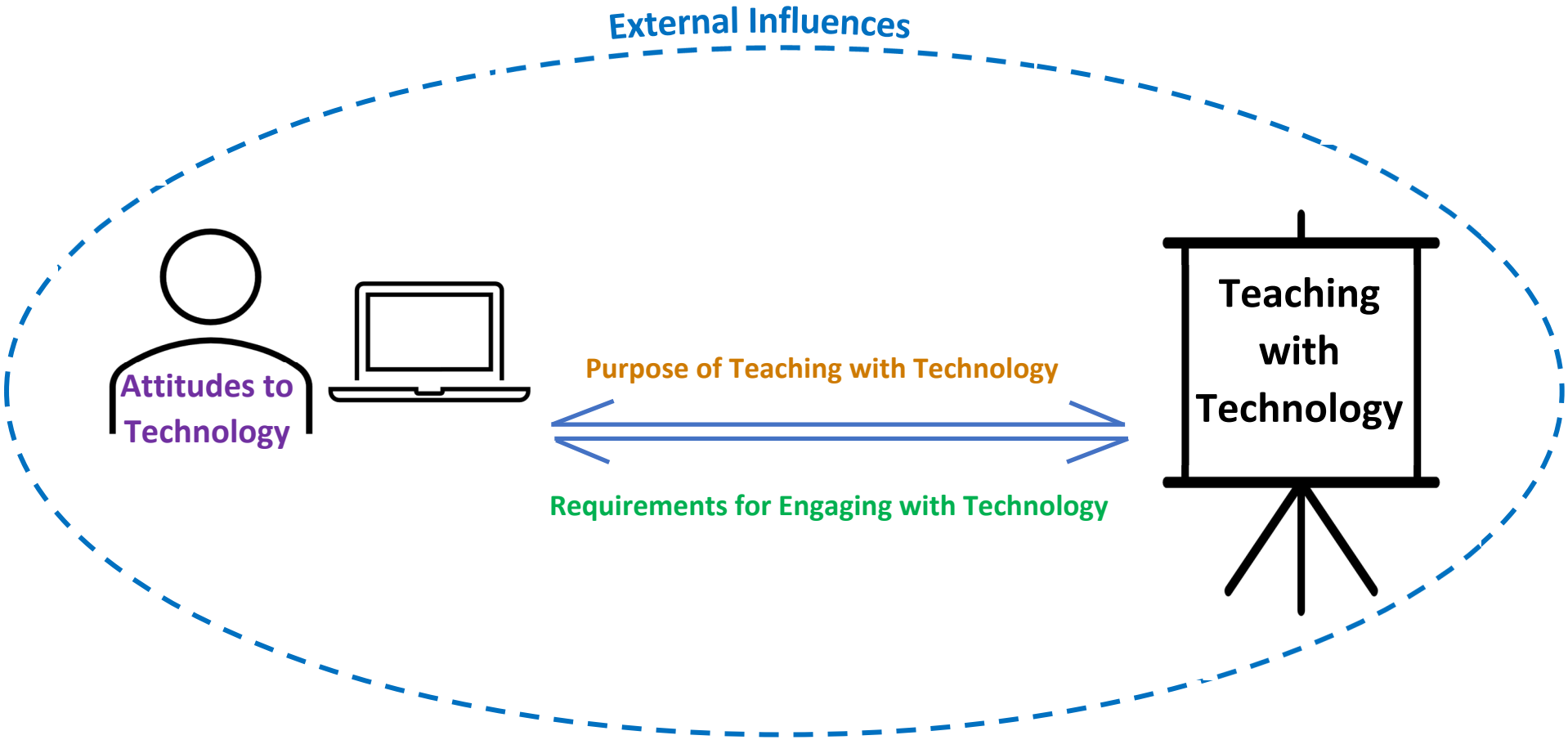

Figure 5.1 Model of Thematic Interaction

5.3.1 Theme 1 - Purpose of Technology in Teaching

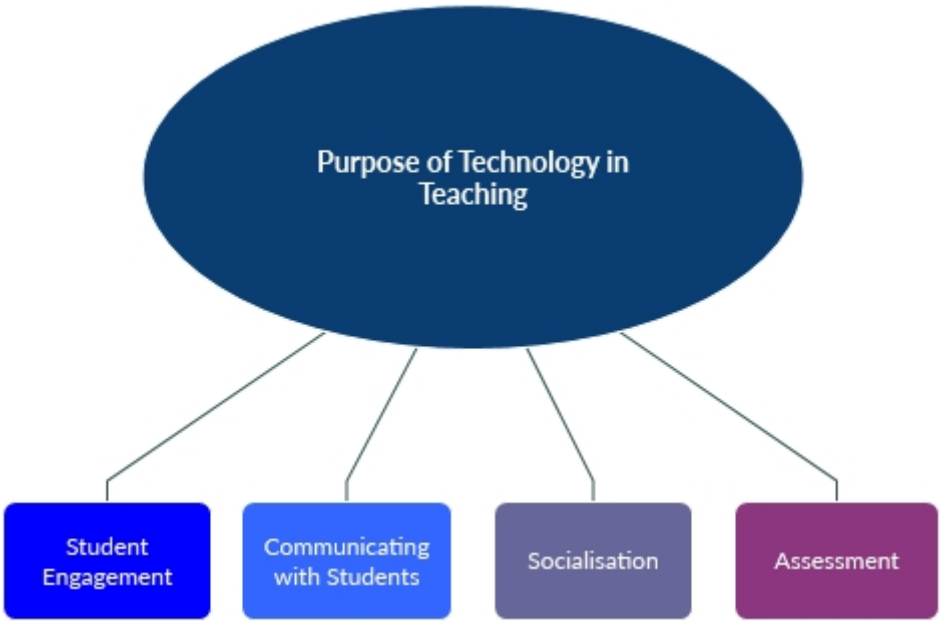

Figure 5.2 Theme 1: Purpose of teaching in technology theme and subthemes

The *Purpose of Technology in Teaching* is defined by how the participants used technology in their teaching. Although technology type varied between participants, technology was used to achieve similar teaching outcomes. Several subthemes emerged from the analysis of the interviews: *Student Engagement*, *Communicating with Students*, *Socialisation* and *Assessment* (see Figure 5.2). The purpose of technology was considered essential in understanding academics and their engagement with technology as it revealed why academics used technology. The theme also explores how academics expected technology to enable their teaching. Figure 5.1 demonstrates the theme and subthemes of *Purpose of Technology in Teaching,* and each subtheme will now be further discussed.

Student Engagement

Using technology as a tool to engage students was identified by many participants. The definition of engagement, although not explicitly stated by participants, included sparking

students' interest, maintaining interest and involvement of students in learning activities. Engaging students was important to participants. Participants chose technology based on ability of the technology to engage students:

> *So, you need to use technologies that allow for higher engagement*… (Olivia)

> *It* [technology] *also allows students to engage that are working in clinical practice but the technologies that I have chosen to use are all trying to get student engagement in the course.* (Jessica)

Technology was described as having a positive impact on student engagement:

> *… in terms of connecting with students, higher engagement, active engagement that sort of stuff like I think it [technology] definitely has positive influence.* (Leah)

> … [technologies] *are good, anything that enables students to engage a bit more and, and also help us be a bit more motivated, I think to engage with it as well, so it's a bit of a win-win situation.* (David)

The use of technology to engage was viewed as a recent necessity, required to enable engagement of students 'these days'. There appeared to be an idea held by participants that teaching now required technology that was appealing and entertaining to students.

> *… you've got to make it visually interesting to students now, it's a different world.* (Amelia)

The need to use technology to appeal to students was attributed by some participants to the student's age. However, other participants considered that a more technology savvy society was the cause for more technology use in higher education. Technology use was described as expected by students, that is, students expected to be learning using technology.

> *If we want to keep engaging … the younger generation we're going to have to be able to incorporate technology into the way that they learn. Because that's just how it is now. And certainly it's only going to get more technology-focused as technology changes so I feel quite open to that.* (Aria)

> *To engage with students of today, and I'm talking about today whether they're older or younger. Everyone has just become technology savvy, in as far as they can click on links and watch things …* (Leah)

Some participants expressed concern that although technology may enable student engagement, it also allowed for students to disengage more easily. There appeared to be a sense that accountability had been lost through a lack of personal connection on behalf of the student to the academic and learning community.

> *I feel that I don't know the students, and the students can be invisible,* [online] *which they can anyway but they particularly can be online because if they don't log-in and comment, they don't log-in and comment so that can be an issue.* (Charlotte)

> *… if you put say quizzes up online for them to do and they're not quizzes that actually go towards their final mark, they're more than likely not to do them because they don't have to do them.* (Lily)

Communicating with Students

Improving student communication was a common reason for the use of technology in teaching. This was viewed as the ability of academic and student to discuss, question, verify or share information. The focus of communication appeared to be primarily around learning materials or assessments, but also incorporated managing student enquiries. Technologies used to communicate with students varied widely from email to message boards to social media. Whatever technology was used, participants chose technologies that fostered communication, while also suiting communication styles and preferences of the academic.

> *So, we don't do anything fancy. I do rely a lot on emails and I think I'm very good at writing friendly helpful non-judgmental, non-curt, non-cruel, non-scoldy emails … if they* [students] *think somebody is going to answer and, you want to be helpful then they settle right down …* (Amelia)

> *… the discussion forum means that it's enduring information for other students to see. I also use an announcer so we use Blackboard as our learning management system [LMS] and so there's an announcement tool that I, as subject coordinator use for …'your assignment's coming back today please check that'…* (Olivia)
>
> *… if I find that technology enhances that communication, I'm more likely to use it, or bring it to the classroom ...* -(Sophia)

Participants discussed using differing technologies depending on the purpose of communication. Aspects of particular technologies, such as asynchronous/synchronous, shared/private information or speed of response, were considered when choosing which technology to use for communication. Communication was viewed as needing to be efficient, sometimes involving mass communication, but also allow students access to their academics for individual enquiries.

> *… we have a discussion board for asynchronous communication around the content.* (Sophia)
>
> *I use chat online which is sort of like … it's a synchronous thing, so you can say to the students I will be on chat for an hour at this time every week and you can ask the question, any questions.* (Jessica)

As noted in the above excerpts, participants discussed communication as a dialogue primarily between academics (themselves) and students. Technology use to create community and peer-to-peer dialogue is discussed in the next subtheme.

Socialisation

Socialisation was independent of 'Communication' as participants framed discussions as peer-to-peer and connectedness between students or the learning group. Technology was seen as a way to enable connectedness; that students were part of a learning community.

Technology reportedly broke down distance and allowed students to be “in the room” with both academics and fellow students.

> *… it* [technology] *also gives them an opportunity to feel part of a group so if we do have a virtual classroom … they can actually see other people that are also studying flexible and we can all communicate and clarify as one, as if we would face-to-face. I just find it more personable.* (Abigail)

> *…* [Facebook] *allowed interaction with the students, the students feel like they belong.* (Jessica)

> *The other thing I would add would be the connectedness that learners can offer an experience with the use of technology and I guess I'm thinking specifically about Second Life. One of the courses that I ran put our students in Australia with students in America* [United States of America] *to learn about each other's health care systems. Well, you're not going to get that out of a textbook. -* (Leah)

Several participants expressed concern that traditional learning communities were being lost and that student peer support was diminishing through the loss of learning communities .A solution offered was further use of technology to enable connections between students, rather than identifying this as a fault of technology itself. Participants felt a responsibility to create opportunities for students to connect. They felt responsible for building safe spaces using technology, for students to create learning communities. Lack of socialisation from technology use was a prominent concern, particularly for participants who had cohorts of students online or in regional and remote settings.

> *We've tried different technologies to actually engage them because we find that when they're off-campus students, it's harder for them to become a part of the team, to feel like they really belong. I think it's the sense of belonging that they lose, as much as anything …* (Isabella)

> *… when students choose the online, the ability, that engagement, that way of connecting with others is not provided. I actually think that is our fault because the ability to do that is there, because look there's all those social*

> *networking factors. I think it's just how we use Blackboard or whatever forum we have to connect, we know students are out there on Facebook, and goodness only knows what. But we're not getting them to connect with each other in a learning atmosphere.* (Samantha)

Assessment

Use of technology for assessment was mentioned by many participants. In this context, technology was viewed as a tool to assess and aid in assessment. The types of assessment ranged from simple online quizzes to uploading of videos of students participating in nursing skills laboratories. Technology-enabled assessment was reportedly used for both formative and summative assessments and generally discussed in positive terms. This indicated that participants felt able and confident using technology for student assessment.

> *… what CATME* [Peer assessment software] *does, it has kind of an equalisation process built in ... it shows if there's disparities and also shows if an individual is underrating themselves or overrating themselves and we saw both.* (David)

> *… there is an online lecture each week, there is a PDF of that lecture and then we have online quizzes each week, to sort of test their learning - for them to evaluate their own learning.* (Jessica)

One participant noted that although technology was being used, assessments remained traditional. The formats and styles of assessments reportedly had not changed over time as technology had become more prevalent, rather, the mechanics of writing and handing in assessments had changed. For example, uploading digital documents instead of handing in hard copy assignments. However, some participants noted they were using technology to enable non-traditional assessments, such as video-recording of clinical skills. Participants wanted assessments to reflect the skills they believed necessary for nursing, be they traditional assessments or not.

… there's a lot of skills that we don't assess very well in our nursing schools really and I've been involved in accreditation so I've looked at a lot of schools across Australia and they're very reliant on traditional methods of assessment. So that's exams, essays, case studies, quizzes, OSCEs those sorts of things. The more students you get, the harder it is to do, innovative type assessments but we should be assessing things like how people interact with patients, how they interact with each other, emotional intelligence all of those things we should be assessing. (Jessica)

We're giving them assignments where they have to video themselves doing communication skills, so they've got to be interviewing somebody so that they can actually demonstrate that; that they have the communication skills. (Isabella)

… we're asking them to record it [Clinical skills assessment] *and show us that they know how to do it and they submit it when they've got it right. So, they're self-assessing or they've got a peer with them assessing and they submit it* [video-recording] *when they think they've got it right.* - (Isabella)

Participants' use of technology in teaching demonstrated thoughtful consideration of how to use technology to achieve teaching aims. Although there was variation in technologies employed by participants, the common subthemes of purpose remained: student engagement, communication with students, socialisation or assessment using technology. Notably, the theme of purpose of technology in teaching reveals a student-centred approach to technology use.

5.4.2 Theme 2 - Requirements to Engage with Technology

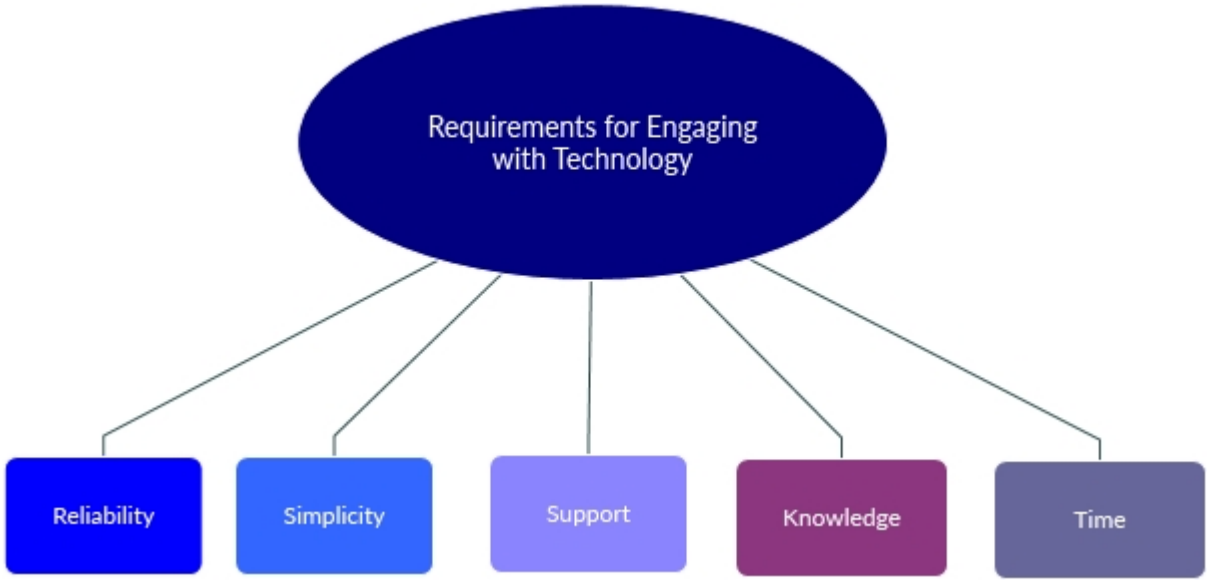

Figure 5.3 Theme 2: Requirement to engage with technology theme and subthemes

The *Requirements to Engage with Technology* is a theme that encompasses academics' prerequisites before engaging with technology. This included inherent requirements of the technology itself, as well as external factors that needed to be considered for them to adequately engage with technology in their teaching (such as Time). Five subthemes emerged: *Reliability, Simplicity*, *Support*, *Knowledge*, and *Time* (see figure 5.3). The subthemes are interrelated as an increase in reliability and simplicity requirements would reduce support and time requirements. Although participants viewed engagement as hampered if the requirements were not present, they persevered with technology despite this.

Reliability

A common stipulation imposed on technology by participants was that technology must work. They expressed concern about technical failures outside of their control causing stress and increasing their workload. Their reliance on technology was noted, and reliability was

essential for the technology they used. Several participants noted having “back-up” plans for teaching in the event of technology failure, indicating mistrust that current technology was reliable. Although not explicitly stated, participants indicated that reliability was an issue for both hardware and software, meaning that both programs (such as LMS) required reliability, as did infrastructure that supported technology use (such as projectors).

> *I suppose when you've got technical issues that occur during class time, that's definitely an issue as well. By the time you call IT and for someone to come up, especially when the workshop goes for an hour, you're just wasting time.* (Lily)
>
> *I’m constantly concerned that the technology is not going to work because we rely on it so much. You know, video conferencing, that sort of thing constantly doesn’t work, or the Internet falls out or whatever.* (Sophie)
>
> *It's just - when technology works, it's beautiful and fantastic; when it doesn't work, it's almost twice the work to try and catch up.* (Isabella)

When technology was unreliable, participants felt their workloads increased by having to fix (or request assistance) and find alternatives to enable teaching to progress (whether that be alternative assessment, communication, etc.) The impact on students of technology not working was also noted by several participants. Reliability appeared to affect the stress felt by both academic and student.

> *… one of the things about the technologies is I want them to work for me. Obviously, everyone wants them to work. I have this concern, that something might not work properly with the students and then they're fairly quick to be critical.* (Charlotte)
>
> *… if it's* [technology] *not reliable it's nothing but stressful to you and then that just flows onto the students*. (Leah)

Several participants noted that in the event of technology not working, support was required. The need for support is a subtheme discussed later in this theme, demonstrating the interrelated nature of the subthemes.

Simplicity

Participants stipulated the technology had to be simple and easy to use. Simplicity was a key component considered in decisions they made around which technologies to implement in their teaching, preferring technology that was easy to implement, edit and manage. They had to be able to understand how the technology worked and how to use it quickly. Easy to use programs were often described as intuitive.

> *… I think it's* [PebblePad] *an incredibly clunky piece of software…the amount of time you need to support people in learning it overrides the benefit in my mind so I think, keep it simple.* (Olivia)

> *If we want to implement a new program, like we did with our PebblePad, we have to put a lot of training resources into it for both the staff and the students so you need to know how much is - or how simple the programs are … when they want us to do a new program, we appoint one of our lecturers to go on the team to make sure that they think it's working and that it's going to be easy for us to use and implement before we'll adopt it.* (Isabella)

> *It* [technology] *has to be intuitive for me, I don't have time to, I'm not one who'll sit down and then you know spend a whole day working out how to do something, if I can't figure out how to use it within an hour, it's gone.* (Paul)

Participants indicated the need for simplicity for students as well. They were acutely aware of the student experience and potential for adverse impact due to complex technology that was not easy to use. Therefore, although the back end of a program that a lecturer engaged with required simplicity, so too did the program interface that students engaged with.

> *… the things I like are simple for the students to use, simple for other academics to use.* (Olivia)

> *If it's too complicated then you're just adding more frustration and stress to students that are already frustrated and stressed.* (Abigail)

The subtheme, *Simplicity,* may be interconnected to the subthemes of knowledge and time. The more complex technology, the more time needed to implement it. In addition, more complex technology was perceived to require more knowledge to understand, again this demonstrates the interrelated nature of the subthemes.

Support

The need for support was a particularly strong subtheme and discussed by almost every participant. Participants felt they needed support to engage with technology in their teaching, regardless of how confident they felt with it. Support included both having assistance with technology if it failed and the resources to demonstrate how to implement or use technology in teaching (training). Participants demonstrated preferences for having assistance close by, although some felt confident enough if support was at least available via phone or email.

> *I mean I'm open to ideas. I'm open to technology. It's just having someone that's available to show you how to use it. To train you how to use it.* (Lily)

> *If I've got someone down the corridor I can just sing out and they can help me, it'll save me hours of trying to work it out myself and that can usually - it's usually something simple that they can fix in a couple of minutes.* (Isabella)

> *… to have support, as in teachers to teach the teachers around the technology. Because sometimes we've got great ideas but we don't actually know how to put it on online so having that support is key, I think. And someone who can step you through, step by step you know and this is how you do this because once you do it and you feel comfortable with it then you will continue to use it and share it with everybody else …* (Abigail)

Several participants further clarified that support needed to include experts in the area of technology in teaching. They wanted experts who could assist them with design, and

collaborate with embedding technology in teaching, that is, learning technologists. Participants felt this would enable them to engage with technology more and increase their awareness of technologies available to them.

> *… having the learning technologist makes a massive difference, having them in the school, because often you get stuck with putting things together and we use - with our online stuff, because we'll have online quizzes and things and you get stuck with that. Having her* [learning technologist] *to be able to come and look over your shoulder and tell you how to do it is really good.* (Isabella)

> *… we've got some technology support people and they come to the school once a week but they're really, really busy so if you had someone to sit down and say hey this is a new system. For example, got a new thing called Splat that you use for group assignments and for peer assessment…I don't know how good it'll be but if you have support to set new things up it makes an enormous difference. Someone to sit down and say this is how it works. Someone on site.* (Jessica)

> *Certainly at the tertiary institute level you know, I've got a girlfriend who does MOOCs [Massive Online Open Courses] … they are just beautiful and they run really well and I say that's just because they've got a team of developers, that sit beside the educator as they put it all together. We just don't have that luxury.* (Leah)

Interestingly, many participants noted support had previously been given, but had since been reduced or removed. Reasons for this were not stated. However, removal of support adversely effected their abilities to engage with technology in teaching and left participants feeling isolated and unsure.

> *… when we moved to Canvas* [Learning management system] *they* [institute administration] *did a pilot where they … helped a number of lecturers, well huge number of lecturers move their courses online and sit down with them and show them how it would work. Then when they implemented the whole thing they didn't have that same support for everyone.* (Jessica)

… we don't have the support there anymore, so you are less, much more on your own. But I found that having the one-to-one with elearning experts because they come around when you're preparing your online content and help you and also in terms of those discussions give you some ideas about what else was available out there in terms of the teaching and learning tools that we could use whereas now we don't have that support. So again, I think that it's a bit wanting really, we are much more on our own. (Sarah)

The school used to have one [learning technologist] *when I first moved to this university. She's no longer employed and so that's all kind of been centralised now … it's a booking system, you've got to develop a relationship with them and it seems like most people are only using them for really big stuff …* (Leah)

Noting reductions or lack of support, participants expressed a need to become self-reliant and figure out technology themselves. Some also noted that official support or training was offered later, by which time they were already self-reliant.

I've been using Camtasia for five, six years at least. But it's only now that the university is providing education sessions on how to use it. (Sophie)

… it was the having it dropped on me, having no training, having to work it out for myself. (Amelia)

… basically, I was just thrown in and I've just had to run with it and teach myself as I go, I suppose. (Elise)

In contrast to concern expressed by participants over lack of/reduction in support, several reported that they could access IT support as required. Notably participants often associated support with a learning technologist being able to assist them.

… they have to put together training programs for us. We're actually really lucky here because we have a learning consultant who knows all the IT programs who works in our school for us a couple of days a week. She'll actually go around lecturer by lecturer and help with IT problems. We've got an IT person as well who's here for three days a week to deal with other IT

issues, because IT is so big a part of anything you do educationally now. (Isabella)

… we have a dedicated person for that [IT support], *the Blackboard learning system that we use. He's very familiar with it, and he's very available. He has sat down with me a couple of times actually and been very helpful when I'm having to build things in. He's very technology savvy and he's very pro-technology and thinks we could be using it a lot more than we are now.* (Elsie)

Knowledge

This subtheme reflects participants' awareness of technologies available to them for use in teaching and understanding how the technology worked. Understanding the technology was seen as important to be able to implement and effectively manage it in teaching. A clear preference for only implementing technology that participants felt they understood and were familiar with was evident.

… you need to really understand the technology itself before you actually integrate it, otherwise there's issues. There's a lot of stuff I'd love to try in a couple of years … I have ideas I'm just not quite sure how to do it but yeah. I'll work it out. (Emily)

Yeah, so it's learning - it's knowing all these different programs that are available and … and knowing how to use them. (Lily)

Participants noted that once they had the knowledge, they were more confident to engage with technology in their teaching. Understanding the technology enabled them to engage more with, and better manage, that technology.

… because I've used it now and I'm comfortable with it I would be comfortable in teaching the students how to use it. (Abigail)

… once you have knowledge of one resource you know you get confident with moving to another as long as you're not so comfortable you can't move … (Samantha)

> *… probably my only inhibition is my knowledge of it and of course I can always learn so.* (Aria)

A logical link can be made between simplicity and knowledge of technology; the simpler the technology, the easier it can be understood with confidence in engagement.

Time

Time was a common concern raised by many participants in relation to engaging with technology, which was seen to be time-consuming. They viewed themselves as time-poor and reported not having time to engage with technology because of the time-consuming aspect of it. Introducing new technologies, rather than updating or changing aspects of existing technology, was seen as particularly time intensive. Interestingly, few participants discussed efficiencies that technology could create.

> *… new pieces of software, to try out and I don't think academics got time and many of them don't have skills.* (Olivia)
>
> *People think online courses are easy to, you know that it's a time saver but it's actually more time intensive to do really good stuff online …* (Jessica)
>
> *I just didn't have time and so time is a big factor because developing Internet or IT stuff, it's time-consuming and that's why unfortunately we end up with videos of lectures that we've previously done that just gets plopped in …* (Samantha)

Participants required time to obtain knowledge of technology and time to review their current use of technology. They felt they needed time to fully understand a technology before they felt able to confidently implement it. The ability to trial and figure out potential issues was also seen as a time-consuming requirement of implementing technology in teaching.

> *… Time, you know wanting to include certain things, for example the polling* [live polling] *that's going to take me a lot of time to get that sort of setup and*

nut it out and make sure I'm confident in using it. So I'm gonna have to allocate some time to have a play with that and make sure it's working well and also that it is in the right context for what I'm trying to get across. (Aria)

The problem is time, to really integrate new technology you need time. And you need time when you're not really doing anything else because you need to be able to understand the technology yourself thoroughly before you can integrate into your teaching. I have tried to integrate things quickly and it doesn't work well, so things happen that you don't know how to fix it because you don't know the technology as well as you should … (Emily)

5.4.3 Theme 3 - Attitudes towards Technology

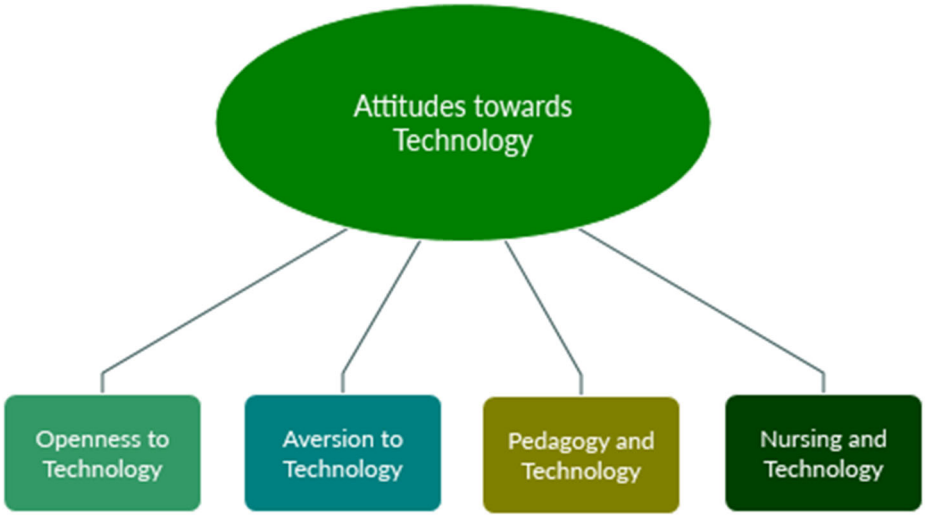

Figure 5.4 Theme 3: Attitudes towards technology and subthemes

The theme, *Attitudes towards Technology*, considers attitudinal aspects of participants' approaches to engaging with technology and influences of the participant's philosophy towards technology in teaching and nursing. The theme brings together various attitudinal influences that contributed to participants' engagement with technology. Subthemes include *Openness to Technology; Aversion to Technology; Pedagogy and Technology;* and *Nursing and Technology* (see Figure 5.4). Attitude has been identified as a significant factor in engagement with technology and influences individual inclination to explore and create with technology in teaching (Brown, 2016).

Openness to Technology

Most participants revealed attitudes that were open to technology use in their teaching. Overwhelmingly, responses were positive toward the idea of engaging with technology. Participants clearly saw benefits of engaging with technology and demonstrated a willingness to try innovations and learn new technologies.

> *I am one to accept change quite well so if we have to go to a new thing it's like: alright I'll go to a new thing and I'll learn about it and I'll use it …* (Abigail)
>
> *I'm very interested in it* [technology]*, I'm willing to try it, if it doesn't work, I'll move onto the next thing, or I'll make adjustments to it when I use it for the next group.* (Jessica)
>
> *Yeah, I'm always willing to learn new things.* (Lily)

Participants expressed a desire to try new things and even fail. They were willing to attempt implementation, even if they knew that it would require further effort to correct issues later or ongoing management of the technology. There was an attitude that they would "have a go" with technology in their teaching.

> *… most of us* [nurse academics] *actually are not too bad about adapting to new technologies or at least giving them a try.* (Sophie)
>
> *I'm keen to do that* [live polling] *next semester but that would be a completely new ballgame for me, I haven't done that before. So, I would really need to prepare, trial it, give it a crack and see how it went I think.* (Aria)
>
> *I'm not frightened to have a try, in fact if I can work to try and find a way how to use it, understand how to use it then I'll have a go at putting it in there …* (Sara)

However, much of the openness came with caveats. Conditions placed on openness were related to requirements that participants felt they needed in order to engage with technology in their teaching, such as time, knowledge and support. These demonstrate links to the

theme, *Requirements to Engage with Technology*, and shows the importance of meeting academics' needs in order to facilitate engagement with technology in their teaching and encourage open attitudes towards technology.

> *I mean I'm open to ideas. I'm open to technology. It's just having someone that's available to show you how to use it. To train you how to use it.* (Lily)
>
> *With IT, I know I can ring someone and there's always someone there that helps me. But I'll give it a go myself and try and figure it out and work it out myself before I try and ring someone …* (Leah)
>
> *I do like the idea of having new things, but I also am very wary of the time it takes and the stress of something completely new.* (Samantha)

In contrast to participants expressing conditional openness were those who expressed self-reliance when it came to engaging with technology in their teaching. There was an emphasis from these participants on their own abilities to navigate technologies and implement them in their teaching. These participants sought out opportunities to engage with technology and implement it within their teaching, rather than waiting for training or recommendations from colleagues.

> *I wouldn't worry about it* [training] *now. I've messed my way through it and know enough to do what I need to do. I probably could do it a lot better, but at least I understand what I'm doing, more or less. A lot of it is just seeing something work and then thinking, yep, I can do that and adopting it.* (Sophie)
>
> *I feel really comfortable with playing around with technology that I'm not familiar with. I mean once again nowadays you can download guides for almost everything on the Internet so if it's something I don't know I'll just download a guide and read it and fiddle around with it and I can usually work out what I'm doing without too much problem.* (Emily)

Some participants noted that they relied on their peers to assist them to choose and implement technology. Although open to teaching technology, they preferred someone else

to test technology or recommend certain technology before trying it within their own teaching. Such recommendations from a colleague would normally initiate the participant's interest in a certain technology and they would then review it to see if they could implement it within their own teaching.

> *I'm one of those people that, I don't go searching for it but when someone tells me about something and I think, 'I could use that', then I'll go out and use it even if I use it badly. So, I'm interested, I am an early adopter, but I don't always do it very well. But I don't go seeking it, so someone will say, 'have you heard about da da da' and I'll go, 'oh that sounds interesting', I'll go and have a play with that …* (Sophie)

> *I encourage everybody here to experiment and then when they've worked out how to do it, then I'll do it. Because I know - we've got some young - a lot younger than me people who are just so IT-savvy. They just know what they're doing with it and they come up with these brilliant ideas and you're thinking, yep, have a go and if you can make it work, you can show me.* (Isabella)

> *I just want to see what is out there. If anyone does tells me anything that have tried and they have been positive about it, I will often jump online to have a look and see if I can use it and if it will be helpful in my programs …* (Sarah)

Aversion to Technology

Although participants expressed openness to engaging with technology in their teaching, they also expressed aversion to it. Such aversion was expressed as anxiety around issues with technology, suggesting in particular, it might not work correctly or as intended. Aversion was commonly linked to the requirements of technology, like caveats to openness expressed in the previous subtheme. There was also dislike expressed for experimenting with technology, particularly technology that was unfamiliar (such as cloud computing). Such dislike for change was expressed as unwillingness to change if current technologies worked or they could not see clear benefits in new technologies.

> *I've got no backup, no tech support here. So, I keep it simple because you know I've got an absolute dread of wiping something completely or deleting something or posting something for a larger group than I intended.* (Amelia)

> *I hate technology - no, I don't hate, I'm constantly concerned that the technology is not going to work because we rely on it so much. You know, video conferencing, that sort of thing constantly doesn't work, or the Internet falls out or whatever.* (Sophie)

> *They did some upgrades and have fixed it* [Pebblepad] *and so now we're back using it again but you always have this hesitancy about using it, thinking, I know it happened last time; do I really want to go there again?* (Isabella)

Although uncommon, some participants expressed fear of technology in either themselves, or observed in colleagues, when it came to engaging with technology in their teaching. This made them wary of technology, and they approached it with caution. Even those participants who were open to technology expressed reservation at its use and maintained critical views of technology, aware that technology was not a cure-all. However, not engaging with technology, due to fear or uncertainty, was generally seen as 'other academics', not a fear that the participant themselves possessed.

> *I'm interested in the innovation but … it's definitely a concern that it's all gonna fall in a heap …* (Charlotte)

> *… a lot of people* [nurse academics] *still get nervous about it* [technology] *and nervous what it is. They get the wrong idea or they think it's too hard so they put it in the too hard basket …* (Paul)

> *There's a lot of resistance to that* [technology] *in health because, I think because of the age group of the academics and some of them is attitude as well, or they fear of you know doing something wrong with the computer, I'm not sure.* (Natalie)

The participants were clear that if they did not like a particular technology, they would not use it in their teaching. The types they reportedly disliked varied, as did their reasons for

disliking it. The commonality amongst participants was that for whatever reason they disliked a technology, they would avoid using it in their teaching. This was not necessarily a function of personal preference, but often a result of the technology not working the way the participant wanted or not meeting their educational goals.

> *I mean I don't love a forum, I just think they're static and flat and I don't like them …* (Olivia)
>
> *… if I feel comfortable using a certain program, and I know how to use it confidently, I will use it. But I suppose if there's a program there that I'm not 100 per cent comfortable that - I'm not really sure how to use it, then I'll probably avoid it.* (Lily)
>
> *If I don't want to use it, I won't.* (Isabella)

Several participants compared themselves with other academics; an 'us and them' mentality. They saw two groups of academics; those engaged with technology and those who were not. This was expressed by both the participants who envisioned themselves as technology-engaged and those who felt they lacked ability or interest to engage with technology. Those academics who saw themselves as technology-engaged expressed frustration as to why their colleagues were not more skilled in technology use. The creation of self-imposed groups (technology-engaged or not technology-engaged) made some participants feel isolated amongst their colleagues.

> *I know that other staff do really clever things, like I know that you can mark and record your comments as you're marking, one of the other lecturers does that. I'm thinking nope I'm good at words.* (Amelia)
>
> *Nurse academics with technology are interesting, and I don't know if it is a nursing thing but there's a few of us that are really into technology and use it a lot and then there's a whole lot of lecturers that are just hopeless with technology, like can't even work* [Microsoft] *Excel.* (Emily)
>
> *I just feel like an absolute weirdo out here on my own because there is so much resistance from other academics …* (Natalie)

Pedagogy and Technology

Pedagogical considerations when engaging with technology in teaching were important to participants. Pedagogical-sound teaching was more important than technology-rich teaching to participants. Technology was required to enhance the teaching and learning experience in a tangible way. Participants demonstrated deep consideration of how they would engage with technology in their teaching and implications on learning for students.

> *… the educational framework that needs to be built around there so giving someone a video to watch or to listen to; there needs to be something after that still to consolidate the learning so it's not just about the visual, it's about getting them to critically think about it as well.* (James)

> *… my fear is that sometimes technology is seen as a way to overcome deficiencies maybe in skill or resources that really face-to-face work would enhance. But we're being shifted for cost efficiency to do more things online rather than it being educationally driven or educationally sound.* (Sophie)

A commonly expressed concern was use of "*technology for technology's sake … "* (Abigail). Participants noted that technology was a tool to deliver teaching, a pedagogical tool. Concerns over technology for the sake of it were expressed by some participants as concern over technology obfuscating learning, and participants noted the challenge in using technology for teaching enhancement, rather than technology itself being the focus.

> *… in the end the technology is the tool to access education. If you're spending too much time explaining the technology, it's in the way of the teaching …* (*Olivia)*

> *… technology has some good uses and if it's used properly, it's not a problem at all. I think we just need to be careful how and why we do it and have our reasoning right. If it's all for a good reason, it's not a problem. I don't like change for change's sake; I like to be able to say, this is the benefit; this is why we're doing it. If you can show me there's a good reason, I have no problem pushing it.* (Isabella)

> *… we can get caught up on the shiny things and making it exciting and motivating for them and as long as I guess you're not losing the message of, you know what is important what am I actually trying to teach them and get that to sink in … I think as long as we are mindful of what the message needs to be then the technology that we're using it's working well but it's not the be-all and end-all.* (Aria)

The need for technology to add value or advance teaching in some aspect was another concern. Participants gave considerable thought to technology use in teaching and whether technology enhanced learning or not. They required more than just interesting innovations; the innovation had to enhance learning.

> *… sometimes I feel like it's technology for the sake of using technology and trying to feel cool rather than actually doing something that's providing an educational advantage.* (Sophie)

> *I think that* [technology aversion] *really stems from my experience of people trying to push different forms of technology which I don't see enhances the learning. It's just a fancy way, it's a gadget that they introduce rather than actually something that does make a huge difference.* (Olivia)

> *I don't like the use of technology for the sake of, oh it's technology, we've got a new plaything. But if it's something that I can go, yes this is going to make understanding easier or engagement easier, or something like that, then I'm all for trying it out …* (Sophie)

The expectation that some participants had of technology in teaching was that it would have to gain some efficiency or give some advantage over traditional teaching methods. This was the standard they measured technology in teaching against: Was the technology teaching better than traditional teaching methods?

> *… it* [technology] *can create a lot more work and you can spend a lot more time trying to sort out these issues* [technical problems] *than if you were just going to do it the old-fashioned way. Because I still know how to do it the old-fashioned way, sometimes it's easier just to do that.* (Isabella)

> *I would say I'm not going to put a blanket* [statement] *out there that it* [technology] *can't help, I just I haven't come across a way that is efficient or make best use of people's time, then that's not better than just using old-school pen and paper.* (James)

One participant noted that perhaps the traditional way of teaching needed to shift to allow for better engagement with technology. The methods previously used that created sound teaching and learning may have to change to fully realise the benefit of technology in teaching.

> *What I see is that we are exposed to a particular technology but what it is, is we're forcing our old ways into the new technology rather than changing the way we teach based on that technology. So for example, Blackboard platform I believe we use it like we would use a classroom … instead of a paper workbook all it is, is the electronic version of a paper workbook. So, you know, rather than thinking what kind of things can Blackboard provide us and then working to the elements. So, let's use it as that teaching strategy, ok you can probably do this very well can we do this this and this? We really mostly just use it based on the old framework* [of face-to-face teaching]. (Samantha)

Nursing and Technology

As teachers of nursing, participants had insights into how technology may impact nursing education, they were aware of the changes that were occurring in healthcare in relation to increasing use of technology. In addition, as nurses, they could observe and anticipate changes that technology was making to healthcare and wanted students to be prepared for this. However, participants viewed their roles as teaching a caring and interpersonal profession, something that was at times in conflict with technology use as this was seen to potentially distract from the caring role.

> *… we're here to teach relationships and teach care and the way in which we do it might be through technology, but it is secondary to the purpose of care.* (Olivia)

> *… if you're replacing people with technology then that's a risk, but really it's - especially in nursing because we are supposed to be person-focused, and I do have some concerns.* (Sophie)

Of particular note, interpersonal skills were a concern for participants, viewing interpersonal skills as the ability to interact with patients and colleagues. They were very aware that the role of the nurse required a high level of interpersonal skills but were concerned that technology may not be a good platform for the teaching and assessment of those skills.

> *… nursing communication is important and interpersonal communication is important, you need to communicate online, I mean that's the way of the world or but you do actually need some interpersonal communication as well so yeah I think there are issues …* (Charlotte)

> *… when you are in health, it's all around communication and listening, and body language and all those things and ... Technology I don't believe can replace that.* (Natalie)

> *I think very strongly that nursing requires interpersonal communication. Good interpersonal communication directly with people. And it makes a huge difference for their lives and if you're doing an online program or predominantly online program, yes I think those things can go under the radar.* (Charlotte)

In contrast, some participants noted that concern over the impact of technology on teaching nursing may have been overstated. They suggested that clinical skills could be demonstrated, and even assessed by various technological means.

> *I think for nursing we were all very scared to think that a practical profession was becoming an online course, but I think we've discovered that if you do it well, you still can get that physical skill assessment part done as well as provide the theory and the interactive engagement even by using online* [teaching] … (Abigail)

According to participants, technology is becoming more prevalent within nursing practice and they identified a need to prepare students to navigate technology in their future practice. They saw it as their role to ensure students were ready to engage with technology in their future practice.

> *I think at the end of the degree, nurses need to be IT savvy.* (Isabella)
>
> *It's part of our role to not only use it* [technology] *for teaching but to actually open their* [students'] *eyes as to how technological nursing is becoming.* (Abigail)
>
> *I think it's gonna really help them* [nursing students] *settle into a health career that's going to be very technology focused in the future. We're losing paper-based notes; there are lots of programs and things that nurses will have to use in terms of work for patient care and data collection and all that sort of stuff. So, I think getting them* [nursing students] *ready for that is really important so we have to be a big part of that role.* (Aria)

Participants viewed their nursing clinical colleagues as apprehensive of technology use. They generalised that nurses in clinical environments were less likely to engage with technology in their workplace and were resistive to technology. Participants displayed an 'us and them' attitude, attributing openness to academics and aversion to nurse clinicians.

> *… there are more nurses out in practice than in academia who are resistant to technology to be honest. I think most of us actually are not too bad about adapting to new technologies or at least giving them a try.* (Sophie)
>
> *It's taken a lot of work with the clinicians, because they* [nurses] *don't like the phones* [mobile phones in wards]*. You have to take them to the - tearoom, they're allowed to pull out the phone and upload these PebblePads and answer the questions versus that you're not allowed to have the phone on the ward.* (Isabella)
>
> *It's fascinating walking around the hospital talking to staff how stressed they are. The whole hospital is absolutely stressed about going to electronic*

records. I understand the fact that it's more work to set it up but it should actually cut your work a little bit once you get used to it. (Emily)

5.4.4 Theme 4 - External Influences

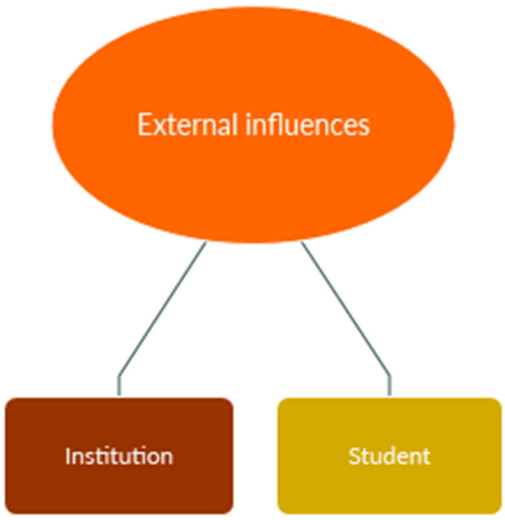

Figure 5.5 Theme 4: External influences and subthemes

Although the focus of this research related to academics and how they engaged with technology, participants raised two external influences that impacted their engagement with technology in teaching; 'The Institution' and 'Students' (see Figure 5.5). They discussed how the institution in which they worked impacted their abilities to engage with technology in areas such as resourcing, support and internal culture. Participants also discussed the end-user of technology in their teaching, namely students. Concern over students included their abilities and access to technology.

Institution

The influence of the employer in this study, the institutes, on the manner and abilities of participants to engage with teaching in technology was apparent across the interviews. Resourcing of technology, either directly (such as software acquisition) or indirectly (such as technology infrastructure) was identified by participants as impacting their abilities to engage

with technology. This subtheme links closely to IT support in that participants wanted to feel they had the support of the institute, not only for technical issues (IT support), but also support in purchasing new technologies and technology infrastructure.

> *… you know the place for which you work* [institute] *and whether they have, the resources and the technology support to help you to improve your technology use or incorporate it more.* (Aria)
>
> *… it would have been brilliant to be able to do it* [create digital storage of OSCE videos] *and it would have been a fantastic teaching resource to be able to pull up your debrief and say, this is what happened and why did you think that? We just can't do it because of cost.* (Isabella)
>
> *I think it's* [IT infrastructure] *an important factor, really important. It's an investment the universities have to make if they are serious about getting much more interesting coursework happening and you know frankly better outcomes and certainly better feedback from students.* (David)

Participants felt that their institutional uptake of new technologies was slow, and this impacted their abilities to implement technological innovations. Many had developed expertise and teaching material using programs outside of those the institute officially supported. In some instances, institutes reportedly later supported the programs participants had already been using. There was an assumption expressed by participants that higher education institutions would experiment with technology, exploring and implementing new technologies as they emerged. However, participants noted that institutes were cautious when it came to technology implementation.

> *By the time the university does anything like the Camtasia training, usually I've either looked at it before or I've got something else in place that I'm comfortable with that I'm not going to bother changing.* (Sophie)
>
> *I never have enough money to trial the brand new and the whiz-bang things out there. I wish they did this. You would think universities would be on the front but they're not. Certainly, there's things that I use this university won't*

give support to because it's not a supported thing but then two years later it will be. (Emily)

Some participants bemoaned a lack of opportunity to experiment with technology in their teaching due to restrictions placed on them by their institutes and disliked restrictions placed on their abilities to explore. They wanted to experiment, trial new technologies and implement them if proven effective. Institutes were seen as stopping or slowing this process.

I love new technology but unfortunately, you're limited to what the university has. They often want, you know, you hear technology out there, but you can't use it because it doesn't really talk to the system that you're using, the LMS [Learning Management System] *that you're using. Or they won't support it, it doesn't really matter they'll still let me use it unsupported but they're a bit wary when you're trying to put things on our LMS that are not compatible.* (Emily)

Except they [institute] *don't let me get what I like all the time, which is fair enough because universities can't run on a single academics wishes …* (Olivia)

Other participants felt they had some flexibility in the technologies they chose to implement in their teaching. An amount of exploration and experimentation allowed for them to trial different or new technologies in their teaching. In contrast, some expressed a desire for their institutes to have more control over their teaching technologies. They felt aspects of technology should be standardised across courses and within schools.

The university is quite flexible with what we use … they don't dictate, providing it is within reason of course they don't dictate what we can and can't do and even in the [nursing] *school they are pretty flexible in that sense but otherwise the only constraint is the limits of the technology.* (Sarah)

The last university I worked at that was better, that was the best in terms of enabling online delivery, for sure and use of technology. So, they would provide, for example, the course home pages they were all set up and standardised by people whose job it was to make sure that happened, the place I'm at now they just send around instructions saying we want your

course pages to look like this and then list it and then somehow you're supposed to do it. (Charlotte)

The effect of the culture and overall institutional attitude to technology were also raised by participants as effecting their abilities to engage with technology. This was identified at several levels: institution wide, within the nursing discipline/department and amongst local colleagues. Participants noted that open and encouraging attitudes towards technology enabled them to collaborate and drive innovation. Whereas, lack of importance placed on technology in teaching (by either the institute, nursing discipline/department or fellow colleagues) reduced participants' desires to engage with technology in their teaching.

… if you've got someone else in your working environment that's keen to do the same kind of things that you are, it does help to promote that positive outlook … let's give this a try, this worked really well, this didn't work well. Give each other advice and ideas. (Aria)

I know my staff would say they would be infuriated because they really want to see a lot more technology, a lot. You know they want to see that and they would be infuriated that the school and the university isn't driving that … (Samantha)

Student

The impact of technology on students was a participant consideration when it came to engaging with technology in their teaching. They were acutely aware of the potential impact that technology use could have on their students, both positive and negative. Participants also discussed the effect of students' technological knowledge. Knowledge was a subtheme that emerged for the nurse academics themselves as a requirement for their engagement with technology. In relation to nursing students, participants felt students had issues with levels of technological knowledge that impacted on their abilities to engage with learning through technology.

> *I think with the clinical uploading documents, we do have students that have problems uploading documents. They don't understand how to do it even though the instructions are there. They really don't have the basic digital literacy skills that are required to upload. Like they're really good with social media but when it comes to uploading documents into the site, yeah, we do have students that don't pass the assessment because they didn't upload the document or they didn't realise it didn't upload correctly and things like that.* (Lily)

> *I think that* [digital literacy] *is where, as a university sort of thing, this is where we need to look at okay, what level of digital literacy skills do these students have? The ones that were having issues. So, I think there was - I think to give an example, I think there's, how many? 1200, 1300* [students] *in the unit and I think close to 400* [students] *had issues.* (Lily)

Of interest was acknowledgement by several participants that the "digital native" phenomenon (the assumption that younger students have more technological ability) was incorrect. Some felt that, although students may have some expertise in areas such as social media, they were not all highly skilled across varying platforms of technology and some students lacked basic computer skills, despite their young age.

> *There's this assumption that just because they're young they are engaged with technology and it's not necessarily true. There are some that will and some that won't. Most of them will engage with Facebook, so they often have Facebook groups and that sort of stuff, but it's not so much the - even when they're doing presentations in class, getting them to do a PowerPoint is probably pushing some of them.* (Sophia)

> *… you just assume everyone knows the basic technology, even some of the school leavers they just don't get it sometimes …* (Emily)

> *… undergrads* [undergraduate students] *don't engage as well, even though they're supposed to be the technological generation, many of them actually struggle …* (Jessica)

Participants considered if increasing technology within teaching was a preference of students. Although many acknowledged that the increase in technology in teaching was inevitable, they identified that some students still preferred face-to-face teaching and questioned whether increasing technology use was being driven by student desire or other motivations (such as efficiencies).

> *I was behind some students they were youngish, you know they're in their early 20s and now they were really complaining about all the IT-based materials and delivery and how they wish they were, could have more standard, you know lecture, workshop-type thing. It was very interesting and it just made me think that, you know, we think that this is what students want, I'm not so sure about that.* (David)

> *… there are some students who love it and some who don't. There are still a big group of students, granted a lot tend to be the mature age ones, they want to have the face-to-face. They miss the face-to-face lectures.* (Emily)

Student access to technology was a big concern for participants. Most identified that students may have issues with access to technology or high-speed Internet. Not being able to access technology was viewed as a barrier to accessing learning in the current teaching environment where technology is ubiquitous. Participants were particularly cognisant of the effect of Internet speed and reliability for rural and regional students and concerned that this may place them at a disadvantage compared to metropolitan students.

> *… it* [elearning] *also relies on the students having to have access to technology. Now, there is an assumption that all students have a mobile phone and whilst that might be more and more correct, there are students that are quite disadvantaged at our university, particularly on the rural campuses … but there was this real push for us to use a lot of technology and rely on it and our students, particularly when they're on clinical placements in small rural places, didn't have internet access.* (Sophie)

> *Because our rural students, and we've got quite a few here in WA* [Western Australia]*, struggle with the download or the access. Most of them come on*

> *campus; if they come on campus, they have access to everything, whereas if they're out, they - sometimes they struggle with it. I know things are meant to be improving with all this* [National Broadband rollout] *but it's not always for rural people.* (Isabella)

In contrast, some participants noted that without the ability to teach using technology, some students would not be able to access higher education. The importance of access to study and the impact this could have on a student were powerfully conveyed. Participants who had this view, expressed that this was the most important aspect of technology, enabling education that might not otherwise be possible.

> *I mean Australia's such a ginormous [sic] country you can have someone living you know remote Queensland who can potentially study you know and study university without leaving their cattle station or wherever they're living and they don't have to move, I mean they can if they want to, but they don't have to, they can study wherever they want as long as they've got satellite or you know some ability to hook up to the Internet they can still learn …* (Emily)

> *… what I can do with technology is I can go into a home in Gunnedah* [rural town in N.S.W] *and I can teach a mum of four kids who works part time. She's at Gunnedah hospital and has no way of being able to get education, get a BN if she doesn't do it online. And I love that we get, I mean you would get about 90 percent women too, and we do also, like you get a lot of first in families*[1] *and I love that what we get to do with technology is change a family's trajectory. That's what I love. I mean I like technology because I love technology but I love that we are making a difference to families. Because 25 years ago these women could not have changed their lives by changing from being an EN into an RN and because they were home with four kids, their husband is the main breadwinner and they're stuck doing what they're doing until all those kids go, and then they say well I'm too old to change now I don't want to upgrade. So, I think the thing about it is, is that we have that*

[1] First in Families refers to students who are the first within their family to attend University. They often face multiple and complex forms of disadvantage due to this (Patfield, Gore, & Weaver, 2022).

opportunity and so I do really believe that technology positively influences the capacity for us to teach students. (Olivia)

5.5 Conclusion

This chapter presented the findings from the qualitative data analysis that emerged from the phase two nurse academic interviews. The analysis revealed four main themes: *Purpose of Technology in Teaching*, *Requirements to Engage with Technology*, *Attitudes towards Technology* and *External Influences*. Each theme also had subthemes that explain varying aspects of the main theme. Subthemes were discussed in detail and selected participant quotes were included to justify each subtheme.

The results presented in this, and the previous chapter, will be merged in the next chapter. The next chapter presents a discussion of phases one and two results and an integrated discussion of both phases. In addition, comparisons between this study's findings and recent literature regarding nurse and general academics' attitudes towards technology are explored, serving to position the new findings from this study in the existing body of knowledge.

Chapter 6: Discussion

6.1 Introduction

The previous chapter explored the themes that emerged from phase two of this study. This chapter integrates and discusses the study findings, in light of the research question. The findings are positioned within the existing knowledge base in relation to attitudes to technologies in teaching. The findings from the quantitative and qualitative phases are merged to integrate and highlight the core outcomes while existing research literature is used to support or contrast outcomes. The study was based in Australia and considers the attitudes of Australian nurse academics in late 2018/early 2019. The study's limitations are covered with recommendations and implications emerging from the findings.

The overall aim of the study was to explore nurse academics' attitudes to technology and the influence attitude has on their use of technologies in teaching. There were three objectives:

1) To investigate nurse academics' attitudes to technology through the Technology Readiness Index 2.0 (TRI 2).

2) To develop an understanding of how and why nurse academics engage with technology through individual interviews.

3) To integrate the quantitative (Objective 1) and qualitative (Objective 2) findings in order to gain a holistic understanding of academics' use of technologies in teaching.

6.1.1 Background

The use of technology in higher education teaching has become widespread and ubiquitous, affecting many areas of teaching and learning (Bond et al., 2020). Nurse education has been impacted by this shift with increasing use of technologies in the classroom (Koch, 2014). This includes elearning, blended learning, online learning and technology within classroom settings (such as instant electronic polling). Given the varying descriptions, this study utilised the broad terms 'technology' and 'technologies in teaching' and elearning. The effect of technology on students and their learning has been well documented, with several

systematic reviews finding that elearning is as effective as traditional educational methods (Castro & Tumibay, 2021; Müller & Mildenberger, 2021; Rizana et al., 2020).

Although there has been a significant focus on students and elearning, there has been less focus on the academic and their role in elearning (Drysdale et al., 2013; Martin, Polly, et al., 2020). In a systematic review of online learning and teaching across all disciplines from 2009 to 2018, instructor-focussed research reportedly accounted for only 3.39% of publications reviewed, compared to learner-focussed research which accounted for 52.74% (Martin, Sun, et al., 2020). This demonstrates that the research focus on technology has largely been related to student experiences. However, academics have been noted to have a significant impact on students' perceptions of the importance and usefulness of elearning (Alves et al., 2020). The Technology Outlook for Australian Tertiary Education 2013-2018 report, identified that academic adoption of technology was an area of concern, noting that students needed teachers to embrace and integrate technology so they in turn could learn to use technology effectively (Becker et al., 2016). Academics have some control over the degree of prevalence of technologies in their teaching. This role is described by Tondeur et al. (2019, p. 1194) as "gatekeepers for technology integration in education".

Attitudes to technology are drivers of engagement with technology and play a significant part in academic engagement with technology in their teaching (Gonen & Lev-Ari, 2016; Petit dit Dariel et al., 2013). As such, the focus of this study was not on the technology or higher education institutions, but rather, the individual academics and their attitudes, including self-identified barriers and enablers. The academic perspective was considered important in understanding their views towards technology and, therefore, influenced the researcher's decision to use Technology Readiness Index 2.0 (TRI 2). The TRI 2 measures the propensity of an individual to utilise and adopt technology to achieve goals (Parasuraman & Colby, 2015b). A critical review of the TRI observed that technology readiness is an antecedent to self-efficacy, risk, and attitude because it is a technology-related personal trait, while other

constructs, such as the Technology Acceptance Model (TAM), are specific beliefs about, and attitudes toward, a particular technology (Blut & Wang, 2020).

The researcher chose to focus on nursing for several reasons. Nursing has a knowledge base that is open to interpretation and, as an applied discipline, involves real world application of knowledge (Neumann et al., 2002). As a consequence, nursing knowledge applied to patients/clients is unpredictable and requires a high level of critical thinking ability (Smith et al., 2009). In addition, nurse education emphasises the importance of interpersonal skills, such as patient interaction and rapport, that are required in the profession (Bhana, 2014). Therefore, nurse academics are tasked with using technology in teaching that encourages development of critical thinking skills and interpersonal skills. Finally, the researcher is a nurse himself and has taught for ten years in higher education. This lived experience of technology in teaching was the impetus of the study. To reduce the potential for this experience to bias the study, strategies such as purposeful sampling of diverse participants, a peer-reviewed interview guide, second reviewer of thematic analysis and member checking, were discussed in detail in the methodology and methods chapter (Chapter Three).

6.2 Integrated Findings

This study is the first to consider Australian nurse academics' attitudes and how they engage with technology. The findings from phases one and two have been integrated in this section to better understand the TR groups and the reasons participants have been designated to these groups. Before discussing the integrated findings, the overall phase one findings from the TRI 2.0 survey are discussed below in the context of previous nurse academic TRI research, in order to contextualise the findings.

The Technology Readiness Index TRI 2.0 was used in this study for the first time with nurse academics (rather than the original TRI). The phase one findings indicate that nurse

academics were technology ready, had higher overall TRI score than the general population, (Parasuraman & Colby, 2015), but with similar outcomes to previous nurse academic research (see Table 6.1).

Table 6.1 – Comparison of TRI and component score

	Current study (*n*=183, *nurse academics*)	Parasuman and Colby, 2015 (n=933, *general population*)	Duval, 2012 (*n*=582, *nurse academics*)	Vuuren, Goon, and Seekoe, 2018 (*n*=79, *nurse academics*)
Index	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Optimism	3.75 (±0.64)	3.75 (±0.8)	3.83 (±0.54)	3.9 (±0.44)
Innovativeness	3.19 (±0.87)	3.02 (±1.02)	3.4 (±0.74)	3.4 (±0.68)
Discomfort	3.38 (±0.78)	2.91 (±0.84)	3.02 (±0.53)	3 (±0.57)
Insecurity	2.86 (±0.8)	2.47 (±0.83)	2.85 (±0.57)	2.7 (±0.44)
Overall TRI	3.28 (±0.55)	3.02 (±0.61)	3.27 (±0.45)	3.2 (±0.31)

Note discomfort and insecurity have been reverse coded

The overall TRI score is indicative of nurse academics' attitudes but lacks nuance in terms of how the nurse academic interacts with technology. In order to achieve this, the authors of the TRI apply a proprietary calculation to the TRI scores in order to create a segmented analysis based on individuals' component scores, referred to in this study as TR groups. The TR groups are used because they identify individuals with common beliefs about technology that do not necessarily fit a single score from low to high technology readiness. For example, one group, Pioneers, is defined as having high levels of both motivators and inhibitors to using technology; a love-hate relationship with technology (Parasuraman & Colby, 2015). The TR groups and relative component scores can be seen in Table 6.2.

Table 6.2 – TR Groups and Relative Component Score

TR group	TR index (rank)	Optimism	Innovativeness	Discomfort	Insecurity
Explorers	1	High	High	Low	Low
Sceptics	2	Low	Moderate	Low	Low
Pioneers	2	High	High	High	High
Hesitators	4	High	Low	Moderate	Moderate
Avoiders	5	Low	Low	High	High

(adapted from RockBridge Incorporated, 2014)

The use of TR groups was unique to this study, as no previous literature on nurse academics using the TR groups was identified. However, previous research has grouped nursing academics according to attitudes. Petit dit Dariel et al. (2013) grouped nursing academics according to the outcomes of factor analysis after Q-methodology, indicating nursing academics attitudes to elearning adoption; Advocates, who thought elearning could transform nursing, Humanists, who thought elearning hinders interpersonal skill development, Sceptics, who found elearning frustrating and thought elearning did not develop clinically competent nurses, and Pragmatist, who used elearning to reinforce what was taught in class but were ambivalent to the impact of elearning. Nsouli and Vlachopoulos (2021) employed a mixed methods approach to nursing attitudes within elearning in Lebanon. Although the method of group formation is unclear, the study found three groups emerged. Pioneers, who embrace elearning and have positive attitudes to elearning, Followers, who have more neutral attitudes to elearning and use technology only as required, and Resisters, who are concerned about the human aspects of the profession (such as interpersonal skills) and believe elearning wastes time. This study confirms some of the groups in the studies above, as there are similarities between the groups in the research above and the TR groups (such as concern for interpersonal skill development). However, the TR groups are based on the TRI survey which allows for comparison across place and time due to it being a relatively stable construct (Parasuraman & Colby, 2015).

Comparing the TR groups of this study to the findings from research on the general public reveals Explorers and Sceptics were more highly represented in the current study (see Table 6.3).

Table 6.3 – Comparison of TR groups

Group	Current study	Comparison (Parasuraman & Colby, 2015)	Comparison 2021 sample (C.Colby, personal communication, 7th May, 2022)
Sceptic	44.8%	29.1%	32%
Explorer	31.1%	20%	15.6%
Avoider	4.9%	17.5%	18.3%
Pioneer	2.2%	16.5%	20.7%
Hesitator	16.9%	17.0%	13.4%

The Explorers, Sceptics and Hesitator groups represented a large proportion of the participants in phase one (more than 90%) and were the three groups represented in phase two. To our knowledge, this is the first use of TR groups (from TRI 2.0) to identify attitudes towards technology among nurse academics. During phase one of this study, the average component scores of each participant (while comparing it to the average TRI score) were calculated within the survey using a simple mean score algorithm. The mean scores were then used in phase two to allow participants to reflect on and discuss their scores in each component. Phase two had similar proportions of the three groups, as demonstrated in Table 6.4.

Table 6.4 – TR groups from phase two

TR Group	Number	Percentage
Sceptic	7	39%
Explorer	9	50%
Hesitator	2	11%

Phase two explored the underlying causes based upon the component attitudes and sought academic perspectives of why they engaged with technology. Integration of the findings will explore the three major groups from phase one of the study that were also represented in phase two; Explorers, Sceptics and Hesitators. The integration compared the similarities and differences of the three groups using the themes that emerged from phase two. The TR groups and emerging themes have been integrated to fully understand nurse academics' attitudes to teaching technologies. Figure 6.1 presents a pictorial representation of the outcomes of data integration and shows the similarities and differences between the TR groups.

	Phase one motivators		Phase two outcomes
TR group	**Optimism**	**Innovativeness**	**Interview**
Explorers	High	High	Positive, Innovation, Confidence
Sceptics	Low	Moderate	Aversion, Cautious, Interpersonal
Hesitators	High	Low	Traditional, Peer to peer teaching

	Phase one inhibitors		Phase two outcomes
TR group	**Discomfort**	**Insecurity**	**Interview**
Explorers	Low	Low	Support, Student, Perseverance
Sceptics	Low	Low	
Hesitators	Moderate	Moderate	Distrust, Anxiety

Figure 6.1: The interaction of factors and the nurse academic TR groups

6.2.1 Explorers

The Explorer group features high innovativeness and high optimism scores (see Table 6.2). Both these components are motivators for technology use, meaning Explorers are highly motivated to engage with technology (Parasuraman & Colby, 2015). The next section explores how these components emerged from the nurse academics' perspectives, integrating both the findings from phases one and two.

Positive

This study identified that participant perspectives on technology were largely centred on positive views of technology, an attribute more likely of Explorers (Parasuraman & Colby, 2015). Explorers scored highly on the optimism component which links to the affinity for technology expressed in phase two. In the interviews, participants described clear benefits of using technologies in teaching, particularly in relation to student engagement. They reported feeling that technology offered access to learning and opportunities that otherwise might not occur, particularly for students who were geographically isolated. The study identified that participants viewed the increased use of technology in teaching as inevitable, and rather than resisting, were open to how technology could enhance and improve their teaching and student learning experience. Overall, the participants were positive about the use of technology in their teaching.

An optimistic view of technology of nurse academics is not unique to this study, however, much of the previous literature is centred around nurse academics' engagement with specific technologies, not technology more broadly (Freed et al., 2014; Jones et al., 2016; Stec et al., 2020). However, in a study exploring nurse academics' elearning adoption in a single institute in the United Kingdom, an 'Elearning advocates' group emerged. This group identified elearning's potential to improve nurse education and considered that technology may transform it (Petit dit Dariel et al., 2013). The optimistic view of these advocates is similar to that of the Explorers in the current study, who also saw the potential for technology

to benefit education and enhance student learning. However, the current study considered the causes for why these attitudes are held.

Affinity for technology may be an inherent trait of a group, such as Explorers, or might indicate an ability for the nurse academic to see the potential benefit of technology for their teaching, which then informs their disposition to technology (Aldahdouh et al., 2020). There may also be a self-selection bias, whereby those in higher education may have characteristics that predispose them to affinity for technology, given that education is known to influence TRI scores and attainment of higher degrees is a requirement of institute employment (Rojas-Méndez José et al., 2017). Affinity for technology is important as attitudes serve as internal motivators to explore and incorporate technologies into teaching (Tang et al., 2021). However, this study did find that affinity to technology was tempered by an awareness that technology was not perfect. There were still concerns and prerequisites placed on technology use identified in phase two, including; technology itself (such as reliability and simplicity) or factors related to the technology (support, knowledge or time). Participants expressing affinity for technology while expressing concern is a unique finding of the study and represents a nuanced view of attitudes to technology. Given the way in which Explorers view technology, this may impact their degree of engagement rather than being a pre-requisite to engage. This finding is unique and indicates that engagement is more nuanced and complex than a choice based on personal preference.

Innovation

This study identified that innovation was important for nurse academics. High innovativeness is a characteristic of the Explorer group, meaning Explorers were more likely to be technology pioneers and technology leaders (Parasuraman & Colby, 2015). Findings from phase one revealed the Explorer group was more engaged with technology than the Sceptic group, using more technologies, more frequently. While findings from phase two identified that innovation emerged particularly in the areas of student engagement, participants were keen to find new and interesting ways in which technology would encourage student

participation. Technology innovation was seen to have potential to enhance, not only content and course engagement, but also academic-student communication and student-student socialisation. This indicates that Explorers were considering, not only how technology enhances the student experience of learning, but also how students connect and engage with their learning communities. This finding is similar to a UK-based study of a business school faculty and digital technologies, which found academics felt motivated to adopt technology in order to increase student engagement, create a more enjoyable learning experience and foster a collaborative student environment (Zhou & Milecka-Forrest, 2021). Petit dit Dariel et al. (2013) found that those who were aware of the evidence that supported student elearning were more likely to have positive attitudes to technology and the potential teaching benefits. The similarities between the previous studies and the current research indicate that academic innovation is linked to the academic concern for student learning. This may be due to the education focus of academics, however, technology for learning content is not the only aspect of this finding. From the interviews, participants described using technology in multifaceted and innovative ways to create engagement and collaborative environments. Explorers, due to their attitude traits, are well positioned to utilise their knowledge (gained from high engagement) to seek ways to apply technology which connects learners to each other, academics and learning materials.

Of note from the findings was a concern regarding control when using technology. Although academics pursue innovation to increase engagement, this appeared to result in a loss of control (Reid, 2014). Academics could create highly innovative learning through technology, but this is no guarantee of student engagement. As technologies increase student agency (in terms of when, where and how they learn), there is a loss of the academic's control over the student learning which shifts the instructor-student relationship (Liu et al., 2020). This shift will be another aspect of change due to technology that academics will need to navigate.

Confidence

In findings from phase one, Explorers expressed more confidence with technology than Sceptics. This is likely linked to the familiarity Explorers have with technology, as findings in phase one also indicated they were more engaged with technology than Sceptics. This is related to the finding that engagement was linked to knowledge of technology, although it is unclear whether knowledge precedes engagement or engagement generates knowledge. However, this finding is complex as Explorers were more likely to strongly agree or strongly disagree that they were confident with technology. This may mean Explorers are aware of their limitations, that engagement with technology has allowed them to find the limit of their abilities or that their confidence has been marred by negative experiences. These findings are supported by a systematic literature review of general academics' adoption of learning technologies, which identified that previous practice with technology often created a frame of reference which then impacted the academics' subsequent engagement with technology (Liu et al., 2020). The findings of the current research demonstrated that participants in phase two used previous experience to frame discussion of their TRI component scores from phase one. Findings from phase one demonstrated Explorers have had more experience with technology and more opportunities for those experiences to be positive or negative, which serves as a frame of reference for future engagement (Liu et al., 2020). This emphasises the importance of allowing for engagement with technology to occur in a supported way, reducing negative experiences that create a future attitude bias. However, the finding may also mean the Explorers were aware of the limits of their abilities. Despite being optimistic and innovative, their engagement had given them a frame of reference of how extensive their knowledge of technology was. They were aware of how much they did not know, creating a duality of confidence; confident within their frame of reference but lacking confidence outside their frame. Regardless of the reason, creating positive engagement with technology would allow for knowledge and confidence to increase. This finding is unique to this study and requires further exploration in the area of creating positive

technology experiences for academics. This would result in a broader frame of reference for nurse academics, no matter their attitudinal group.

6.2.2 Sceptics

Sceptics scored low on optimism and moderately on innovativeness from phase one. Parasuraman and Colby (2015) found that sceptics tended to have a detached view of technology, with less extreme positive and negative beliefs. The next section explores the nuance of how these components emerged from the participant's perspective.

Aversion

In contrast to the optimistic view of technology, phase two found an attitude of aversion, with links to the Sceptic group's lower optimism scores from phase one. It emerged in phase two that aversion attitudes were mainly centred around the academic requirements of technology (simplicity and reliability) and external factors relating to technology (time, knowledge, support). Although aversion and affinity attitudes to technology appear in contrast to each other, both acknowledge the same requirements for technology engagement. This indicates that regardless of attitudinal group, nurse academics had similar technology requirements. The aversion attitude revealed requirements of technology that enable engagement, similar to the Sceptic group, who need to be persuaded to engage with technology compared to the Explorer group who appear to seek technology, with the requirements enhancing their engagement.

The idea of an underlying cause for aversion is confirmed by a study of UK-based business school faculty and digital technologies, which found academic distrust of technology was based on attributes such as lack of reliability and high resource allocation (in particular, time and money) (Zhou & Milecka-Forrest, 2021). The similarities to the current research indicate there may be some common areas that require addressing in order to increase engagement of technology. One of the themes that emerged from phase two, and discussed at length in the qualitative results in Chapter Five, was the participants' *Requirements for Engaging with*

Technology, which included subthemes such as *time*, *support* and *reliability*. Given the cautious nature of the Sceptic group, there may be a need to meet the underlying cause of aversion before Sceptics will engage with technology. Meeting the academics' technology requirements may increase engagement from both Sceptics and Explorers.

Cautious

During phase one, Sceptics were identified as less innovative, and phase two found that pedagogical concerns were a key reason for lack of innovation. Concerns emerged in phase two that technology may interfere with learning if it is not implemented for sound pedagogical reasons. In addition, participants wanted technology to improve or add value to the teaching and learning experience. This is in line with the Sceptic trait of needing to be convinced that technology will provide a benefit in order to adopt technology (Parasuraman & Colby, 2015). Liu et al. (2020) had similar findings, that when the relative advantage of a learning technology is demonstrated to academics, adoption of that technology increased. However, the current study demonstrates a more unique aspect related to technology innovation requiring a pedagogical benefit. Concern regarding pedagogy issues is similar to the finding of Petit dit Dariel et al. (2013), suggesting some nurse academics required a deep understanding of the implications of how technology would impact their teaching. Participants were reluctant to change unless they could perceive the benefit for their teaching and students (Petit dit Dariel et al., 2013). However, the low engagement of Sceptics, demonstrated in the lower level of technology engagement found in phase one (technology count and technology frequency), may prevent Sceptics from perceiving the benefit a learning technology may allow, having a narrower frame of reference in relation to technology. This means that Sceptics will require demonstration of benefit from those familiar with the technology, either Explorers or other parties (such as learning designers), in order to consider adoption.

Interpersonal skills

The lower optimism and innovation of the Sceptic group from phase one may also be explained by the value participants placed on interpersonal skills within their profession in their interviews. A concern that emerged from phase two was participants' concern that technology may impact the ability of students to learn interpersonal and physical nursing skills. Interpersonal skills are highly valued in nurse education as they are viewed as an essential component of a competent nurse (Bhana, 2014). The findings of this study indicate that nurse academics were reluctant to engage with technology that may impact the development of interpersonal skills. There was uncertainty about whether technology could adequately replace traditional methods of teaching that involved higher levels of face-to-face interaction and the development of interpersonal skills. This finding confirms those from Petit dit Dariel et al. (2013), which found some nurse academics believed that elearning may cause the essence of nursing to be lost, that elearning could not replace the communication skills learnt in person and that nursing students needed hands-on experience to learn their profession. Similarly, Sweeney et al. (2016) reported nurse academics were concerned that the interpersonal relationship of traditional face-to-face teaching would be lost if technology was used in the delivery of teaching, and this would impact the students' interpersonal skills development. This indicates that technology challenges the traditional ways in which interpersonal skills are taught in nurse education. Sceptics would prefer that technologies enable the development of interpersonal skills before they supplant face-to-face teaching. However, a unique finding of this study was that some participants already considered ways in which technology may improve interpersonal communication. This demonstrates that concern over interpersonal skills was not universal, with some participants utilising technology to develop interpersonal skills. This may be related to the Explorer group's different attitudes and familiarity with technology. The Sceptics' narrower frame of reference, from low engagement and low optimism with technology, means they may be unaware of technological means to increase interactions and build interpersonal skills, reducing their ability to use technology to facilitate the development of interpersonal skills.

6.2.3 Explorers and Sceptics

Although Explorers and Sceptics had differing scores across optimism and innovativeness in phase one, both groups had similar scores for inhibitors (discomfort and insecurity). Both Explorers and Sceptics had low scores for discomfort and insecurity, which will be explored in the following section, incorporating the findings from phase two.

Support

The findings of this study demonstrate that participants generally felt supported in utilising technology in their teaching, which is likely to influence their discomfort and insecurity scores. The participants felt that they had institutional support and technical support to engage with technology. However, this finding diverges into two views of support; one group wanted more guidance and direction, while the other wanted more freedom and opportunity to innovate. This is likely due to differing groups' (Sceptics/Hesitators and Explorers) attitudes to technology, influencing what form they would prefer support to take.

This is in contrast to a finding from a review of barriers to adoption of instructional technologies for academics, that summarised support was a barrier to technology use, with a common complaint from faculty being lack of support in the use of instructional technology (Reid, 2014). The unique findings of the current study require further research to determine why the participants felt supported overall, however, some potential reasons for the difference were considered. The difference may be due to the increasing prevalence of technology since the Reid (2014) study, allowing academics to develop more familiarity with technology use in teaching. Institutes may have also increased support, with this now being an enabler of technology use. It may even represent a maturation phase of the presence of instructional technology in higher education, with institutes providing the support required, while academics have become more familiar with technology. For example, the use of learning management systems (LMS) in higher education is now almost universal (Brown et al., 2015), meaning the focus now becomes how to make better use of LMS, rather than

initial adoption. This may also explain the divergence in participant perception of support, seen in this study's findings. As support moves beyond basic implementation, Explorers, Sceptics and Hesitators may require different types, levels and approaches to support them. The difference in support of each group is likely centred around their attitudes to technology; Explorers need support to innovate and explore while Sceptics need support for guidance and reassurance.

Student

A finding from phase two was a strong emphasis on student-centred learning. The finding shows that participants put aside their concerns about technology if they could perceive that it would benefit students or their learning experiences. However, they were conscious of the impact innovation would have on students, being aware of students' needs (such as ease of use), which tempered their enthusiasm for technology. A highly student-centred approach is important as it has been shown to benefit learning, particularly for non-traditional students such as first-in-family students (Harris et al., 2013).The findings confirm a study by Zhou and Milecka-Forrest (2021) which demonstrated that academics were largely student-focussed and believed appropriate technology could enhance student learning, and were aware of the impact technology could have on the learning experience (Zhou & Milecka-Forrest, 2021). The similarities reveal that academics with student-centred approaches appear to view technology as an overall benefit, while being cautious about its impact on student learning. The student-centred approach is likely held by both Explorers and Sceptics, however, Explorers are more likely to view the benefit of technology on learning while Sceptics demonstrate concern of the impact technology will have on learning.

In addition, it was found in phase two that participants were conscious of the healthcare environment that students would enter upon graduation. The recent Educating the Nurse of the Future Report (Schwartz, 2019) in Australia notes that institutes educating nurses must prepare them to be informed, critical, users of technology. Both Explorer and Sceptic groups would be aware of the nursing environment and the need to prepare students to enter a

technology-rich healthcare setting. The findings of this study demonstrate that participants were student-centred in their use of technology and aware of the need for preparing technology literate students.

Have a go

A unique finding of this study was the willingness of academics to practice teaching with technology, despite having reservations or other unmet requirements (such as time). This mentality may be part of the explanation of the low scores for insecurity and discomfort across Sceptics and Explorers. This finding is described as, “have a go”, an experimental disposition that acknowledges the potential shortcomings of a current situation (such as lack of time or complex technology) yet persists with finding ways to engage students in learning through technology. This attitude is likely the result of feeling supported in a student-centred approach but moves beyond those two aspects into an exploration of what is possible with technology. This is in contrast to the findings of a qualitative study of multidisciplinary faculty perceptions, based in the United Sates, about why technology was and was not being used by faculty during their teaching (Polly et al., 2021). The authors identified that faculty felt little intrinsic motivation to modify and update their courses with technology, suggesting this may be due to a lack of incentives or other unmet requirements (such as workload or lack of support). However, one study of nurse academics as they transition to online teaching found that they felt frustrated and struggled with teaching online but continued to invest time and effort to be successful in changed teaching formats, suggesting that despite their negative feelings, they would persevere with technology in teaching (Sword, 2012). This demonstrates that the ‘have a go’ finding may be unique to nursing, yet cultural differences between the United States and Australia or the lack of healthcare faculty in the study may explain the difference. There may also be a difference in the support felt by participants, where the current study participants reported feeling supported, while Polly et al. (2021) note that participants felt a lack of support. This suggests that support is a critical aspect of this finding. The ‘have a go’ mentality is important as it allowed participants to feel like they could

experiment and trial technologies in their teaching, increasing their engagement, knowledge and broadening their frame of reference. Further study into how to develop and foster this attitude is warranted.

6.2.4 Hesitators

Hesitators scored high on optimism and low on innovativeness in phase one. Parasuraman and Colby (2015) found that hesitators were the most cautious of the groups due to their low innovation scores, despite being optimistic about technology. However, findings from phase one showed that Hesitators had moderate levels of discomfort and insecurity, in contrast to the low levels of both Explorers and Sceptics. The next section explores the nuance of how these components emerged from the participants' perspectives.

Traditional

The findings of high optimism and low innovation from Hesitators in phase one may be explained by the findings from phase two in relation to technology use in student assessments. Findings from phase two identified that technology was used for both formative and summative assessments and these were discussed in positive terms, but although technology was being used, the assessments were technology-enabled traditional assessments. For example, written assignments and exams that were essentially the same as traditional hard copy formats were used, but the writing and 'handing in' assessments had changed, that is, uploading digital documents rather than handing in hard copy assignments. This finding indicates that although technology may be used, it may replicate traditional ways of teaching rather than innovating new ways of teaching. These findings concur with a qualitative study of nurse educators, based in the United States, who transitioned from traditional classroom to an online learning environment (hybrid and 100% online), which found the online environment required a mind shift in pedagogy (Sinacori, 2020). The qualitative study demonstrated that although the participants enjoyed using technologies in their teaching, the online environment was very different to traditional teaching which

required them to change the way in which they taught. There could be several reasons for this finding; traditional teaching methods may have a more pedagogical sound basis or pedagogical history, nurse academics may be more familiar with traditional teaching impacting their frame of reference for using technology or traditional methods may also be more time efficient, even with the use of technology. Regardless of the reason, the findings from the current study indicate the use of technology in teaching can digitise traditional teaching rather than utilising technology for innovation, which may explain the Hesitator groups high optimism yet low innovation.

Peer-to-Peer teaching

The lack of innovation from phase one might be explained, in part, by the findings from phase two, where some participants relied on their peers to assist them to choose and implement technology. Although open to using technology in their teaching, these participants preferred someone else to test technology first or recommend certain technology before trying it within their own teaching. This indicates that these participants were not technology leaders, as such, but would adopt technology's that could be demonstrated to have benefit. Additionally, they could see how other academics had used them in similar situations, which matches the phase one findings of low innovation yet high optimism. These findings are confirmed by a review of faculty (multi-discipline) development in higher education, where teaching with technology was a central component of the study, and found peer-to-peer teaching as a theme (Belt & Lowenthal, 2020). They summarised that peer-to-peer teaching occurred in informal (e.g. communities of practice) and formal ways (e.g. workshops) and that commonly, early adopters could act as technology facilitators for late adopters or laggards (Belt & Lowenthal, 2020). Preference for peer-to-peer teaching may be due to discipline specific knowledge held by faculty in the same discipline, that is, other nurse academics are aware of the nuances of nurse education, making their recommendations or support more targeted and relevant. This is supported by a study of Irish nurse academics' transition to blended learning, which found that sharing of

resources was not only important for collegial support but also led to a time saving effect as other academics could utilise innovations identified by their peers (Sweeney et al., 2016). Peer-to-peer teaching appears to be especially important for those nurse academics with low innovation scores (such as Hesitators), as their more innovative colleagues (such as Explorers) provide a way for them to access technology in their teaching.

Distrust

Although Hesitators scored highly for optimism, findings from phase one demonstrate they had moderate scores for discomfort. Discomfort with technology refers to feeling a lack of control (Parasuraman & Colby, 2015). This was found in phase two, when some participants referred to disliking their reliance on technology, as they were concerned it would not work as intended. Several participants noted having "back-up" plans for teaching in the event of technology failure, indicating mistrust that technology was reliable. It also indicates an inability to troubleshoot and find solutions using technology, which may be influenced by Hesitators' low innovation score. The finding of distrust due to reliability was confirmed in a review of general faculty members' adoption and use of online tools for face-to-face instruction (Brown, 2016). The review found that unreliable technology created negative perceptions of educational technology. However, hesitators maintained optimistic views of technology despite their discomfort, meaning their low innovation was the most likely aspect to affect their comfort level with technology. This may mean that hesitators need low tech options to feel secure, for example, traditional whiteboards as well as Wi-Fi-enabled projectors, providing participants with a "back-up" when using technology. The unusual combination of distrust and optimism is unique to this study and indicates that the Hesitator group has a complex relationship with technology, which requires further research.

Anxiety

Hesitators scored moderately in the insecurity component, meaning they were concerned about technology and potential adverse impacts. Although uncommon, some participants in

phase two expressed fear of technology themselves, or observed fear of technology in colleagues, when it came to engaging with technology in their teaching. This made them wary of technology and they approached technology cautiously. Similar feelings were expressed by nursing faculty based in the United States from multiple institutes in a study of perceptions of online teaching efficacy (Richter & Idleman, 2017). They found that faculty were open to technology, but reported technology use as challenging, frustrating and overwhelming. The current study confirms these findings, indicating that technology may cause some nurse academics considerable anxiety. Being anxious of technology is likely a significant issue that effects engagement of technology for some nurse academics. Liu et al. (2020) suggest that negative attitudes to technology are likely to be barriers to technology adoption, indicating that the moderate levels of inhibitor components found in the hesitator group may impact their technology adoption, which may explain Hesitators low score on innovation.

The use of TR groups is unique to this study and has been combined with the interviews conducted in phase two providing insights into nurse academics' attitudes. The differences and similarities of the three largest TR groups (Explorers, Sceptics and Hesitators) were discussed, while being compared to previous literature. The use of the TR groups to explore and explain the attitudes of the participants is unique and provides nuanced insight that would not be possible with the Technology readiness index score alone. The attitudes held by participants were thoughtful and influenced by the frame of reference of each individual. Several of the findings are unique to this study and demonstrate the generation of new knowledge in the area of nurse academic attitudes to technology in teaching. The next section will consider other factors that influence engagement with technology arising from the study.

6.3 Demographics and Technology Readiness

Before considering the external factors that influenced participants of this study in relation to technology readiness, it is worthwhile to consider some internal factors that did not demonstrate an influence on technology readiness. The findings from phase one demonstrated no link between TRI and age, academic rank or gender. However, in phase two participants did consider that age and rank impacted individuals' abilities with technology (gender was not discussed by participants). Findings that emerged from phase two included participant discussion of younger or newer academics having more technology abilities or being more technology savvy. This finding may indicate the assumption that 'younger people are tech savvy' is held by participants (Combes, 2021), however, phase one did not substantiate the assumption. The influence of demographics on technology engagement is mixed in the literature. Previous TRI studies have found small or no effects on TRI due to gender, age or experience (Duvall, 2012; Sulisworo et al., 2020; Vuuren et al., 2018). Research focussed on nurse academics and technology has also found that demographics have little, if any, influence on nurse academics' engagement or use of technology (Fernández-Alemán et al., 2014; Nguyen et al., 2010; Richter & Idleman, 2017; Robinia & Anderson, 2010; Roney et al., 2017). Australian nurse academics in the year 2019 were predominately female (88%), with an average age of 47.5 years (Australian Institute of Health and Welfare, 2019), which is reflected in this study. They are also highly likely to hold a master degree or PhD, which this study confirmed—with more than 90% of the participants of this study having a master degree or PhD. The homogenous demographic nature of the nurse academic population may play some part in the lack of influence of demographics on attitudes to technology. The sample size may also not have been large enough to allow for detection of the nuanced differences due to demographics, however, larger studies have also failed to detect demographic differences (Duvall, 2012). Given the findings of this study and previous research, it is likely that demographics have little influence on attitudes to

technology. This then should draw attention to other areas that could influence technology engagement, such as those discussed below.

6.4 External Factors Influence on Technology use

Nurse academics' work within a discipline which is within institutes, each impacts the ways in which they can engage with technology. Hence, their abilities to engage with technology can be enabled or restricted by these external factors. As such, the next section considers the external factors identified by the nurse academics in this study. These external factors emerged in the following areas: Institution, Faculty Culture, Students, Technical Knowledge, Time/Workload and Simplicity and Reliability.

Institution

The findings of this study indicate that institutes can influence nurse academics' abilities to engage with technology. The two key areas identified in the findings were resourcing of technology (such as hardware and software acquisition) and support. Support included both having access to technical assistance and access to professional development. Of note was the finding that participants expressed an expectation that institutes would lead technological developments and innovations, yet these institutes were viewed as cautious in their approaches to technology. The need for support was a common finding from the literature, being one of the most often cited requirements for academics to engage with technology. The literature review identified support and training as the single biggest theme, present in 29 of the reviewed articles (see Table 2.2). In addition, a multidisciplinary review of barriers to adoption of instructional technologies found lack of support was a barrier to technology use, with a common complaint from faculty being lack of support in the use of instructional technology (Reid, 2014); a finding confirmed by the current study. The similar findings across previous research indicates that the requirement for support is not discipline specific to nursing. However, the findings demonstrate that support is an ongoing concern for nurse academics and a potential barrier to engagement with technology.

Faculty Culture

The impact of peer culture emerged in the findings. Although the findings did not demonstrate a difference in TRI score between institutes, findings from phase two indicate that within institutes there appeared to be cultural influences on technology use. In the interviews, several participants described enthusiast vs pessimist groups, regarding technology within the nursing discipline, and that this influenced their abilities to engage with technology. This explains the phase one findings of three distinct TR groups, with varying enthusiasm for technology. The participants noted that encouraging attitudes among peers towards technology enabled them to collaborate and drive innovation, whereas lack of importance placed on technology in teaching reduced participants' desires to engage with technology in their teaching. The influence of colleagues in relation to technology adoption was explored by a mixed methods study based in the United States, that examined the effects of instructors' academic disciplines and prior experience with the learning management system (LMS) – Canvas, on current use (Fathema & Akanda, 2020). They found that colleagues influenced patterns of adoption of learning technology through their communications, values, academic identities and dominant teaching practices. The current study is the first to apply the TR groups to the nursing discipline, demonstrating a unique proportion of the TR groups that likely has an impact on technology peer culture. The cultural attitudes to technology within different institutes' disciplines of nursing, likely plays a role in the ability of individual nurse academics to engage with technology.

Students

The centrality of students in nurse academics' considerations has been discussed above, however, they likely play a general role in considerations of technology implementation as they are the "end users" of technology in teaching. Some participants viewed students as drivers of the increasing use of technology in teaching; however, other participants considered whether students were less enthusiastic about technology, as some students

preferred more traditional teaching (such as face-to-face). This led participants to question if other motivations (such as efficiencies) were behind the increase in technology in teaching.. This study confirms the findings of Zhou and Milecka-Forrest (2021), that academics were concerned about pedagogical effects of technology in teaching, while establishing that participants were aware that students may prefer face-to-face teaching. This indicates that participants are not convinced using technology is always for the benefit of student learning nor is it necessarily the drive for increasing technology use in teaching.

Technical knowledge

Engagement with technology requires understanding about how the technology works and how it will work within academics' teaching. The degree of knowledge required to interact with technology will differ according to the technology, and is likely a function of the simplicity and familiarity of the technology, indicating the interrelated nature of these factors (Brown, 2016). The findings from phase two indicated that understanding technology made participants more likely to feel confident to utilise it, while phase one findings demonstrated that a higher TRI was correlated with higher confidence to engage with technology, further indicating a link between knowledge and technology engagement. This finding confirmed a Brazilian qualitative study of nursing professors' use of ICT in their teaching, which found the effective integration of ICT required the development of technological knowledge, indicating the link between knowledge and engagement (Alves et al., 2020). The requirement to develop knowledge of technology is important as it may impact the ability of nurse academics to engage with technology and influence which technologies an academic is capable of using. This may also impact support and the academic attitude as this study found Explorers tend to seek knowledge, while other groups (Sceptics and Hesitators) are more passive when it comes to acquiring knowledge of technologies.

Time/workload

The findings of this study suggest that engaging with technology takes time or additional workload. Findings from phase one demonstrated a correlation between TRI score and frequency of use, indicating that more technology ready participants spent more time engaging with technology. Despite this, findings from phase two describe technology as being time consuming. Implementing new technology was seen as particularly time intensive and may contribute to nurse academics' reluctance in adopting new technology into their teaching. The impact of technology on time is apparent across a broad range of research on nurse academics and technology (Buxton et al., 2015; Gonen & Lev-Ari, 2016; Hampton et al., 2020; Jones et al., 2016; Porter et al., 2020; Richter & Idleman, 2017). A review of the impact of academic workload allocations across all disciplines in relation to technology-enhanced learning in higher education, found academics' perceptions of technology as time-consuming was a major barrier to incorporating it in their teaching practice (Gregory & Lodge, 2015). The current study confirms the findings of Gregory and Lodge (2015), however the current study findings indicate that implementation of new technology was considered especially time-consuming by participants. The relative impact of various technologies on academics' time may be an avenue of further study in order to understand which technologies have more or less impact on academics' time. Notably Gregory and Lodge (2015), found that if technology engagement was recognised in the academic's workload, this led to higher uptake and more positive experiences for academics. This indicates a need for institutes to recognise the time component of technology in order to increase academic engagement.

Simplicity and reliability

The findings of the study indicate that simplicity and reliability of a technology are a factor in academics' engagement with said technology. Participants displayed negative attitudes to technology they deemed as overly complex or unintuitive, describing how they would avoid using them. This confirmed findings from a study of the nursing and physiotherapy faculty

use of ICT tools in a single Greek higher education institute, which found that the simpler the ICT tool was, the more frequently it was used (Tzitzolaki et al., 2014). However, findings from phase one indicate that higher TRI scores are related to higher technology engagement, regardless of complexity. This suggests that the simplicity and reliability of a technology may have an element of subjectivity dependent on the participants technology readiness. This may also be related to the ability of the academic to make sense of the technology and to be able to see how a technology 'fits' into their current teaching practice (Liu et al., 2020). Regardless, the more complex and unfamiliar a technology is, the less likely it will be used by staff. This is important when considering reasons for attitudes to technology, as some attitudes may arise as a result of the technology itself.

This section considered some of the external factors other than attitude that could impact on technology use, that arose from the study. The factors discussed are generally outside of the control of academics and these factors may influence the nurse academic's engagement with technology. The next section discusses the limitations of the study.

6.4 Limitations

The findings from this study may be applied to nursing and midwifery academics, given the similarities to other studies. However, given that there are aspects of nursing education that are unique, application to disciplines outside of nursing may be limited. The study was based in Australia and the sample came from across Australia, which means application to other countries may also be limited. However, some findings confirmed previous findings from multidisciplinary studies, indicating there may be some findings that are more universal in their application.

The limitations of phase one are primarily related to sample size. The researcher aimed for 280 completed surveys, but only 186 were returned. The surveys were prepared following

suggestions from the literature to boost response rates, such as reminder emails and having a simple, time efficient survey (Giuseppe 2006, Sue & Ritter 2007). The lower response rate reduces the power of the study, limits generalisability and may mean that significant outcomes were not determined (Lakens, 2022). Statistical testing that required minimum numbers across groups was also limited in some instances, although alternatives such as non-parametric testing were sufficient in these cases.

Response bias is another potential limitation of the study. Compared to the National Health Workforce Dataset (2019), the survey appears to be representative of the population of nurse educators in terms of age and gender. However, response bias, the bias that certain people within a population are more likely to respond to a survey, may still effect the data, particularly from those who were technology averse, as these individuals may be more unlikely to engage with an online survey about technology (Spencer et al., 2022). Compared with other studies that utilised the TRI, this study has similar results, which indicates the sample is unlikely to be biased (Duvall, 2012; Vuuren et al., 2018).

The number of phase two interviews was deemed appropriate as data saturation was reached. However, there is a possibility that further interviews may have uncovered other unique aspects not considered by the researcher. The interviews were conducted by Skype, which meant the interviewer could not directly observe body language and facial expressions, although field notes were kept regarding tone and how engaged the interviewee seemed to the researcher. A full quantitative analysis (including TRI segmentation) was not completed prior to interviews. However, each participant was assigned an average component score (Optimism, Innovativeness, Discomfort and Insecurity) from their survey, and the interviewee was asked to respond to their scores during the interviews.

The survey and interviews occurred prior to the coronavirus pandemic (COVID 19) and subsequent lockdowns, which then had no impact to the collection of data on this research. The implications of this in terms of nurse academics' attitudes to technology are worthy of investigation, but beyond the scope of this study due to the timing of data collection. Reviewing the impact lockdowns and mandatory online learning has had on academics' attitudes to technology is an area for further investigation.

6.5 Recommendations and Implications

This section discusses the implications that arise from the findings. Recommendations for nurse academics and institutes, as well as areas for further research are discussed. Many of the recommendations and implications are interrelated, demonstrating that nurse academics engaging with technology is a complex interplay of many factors.

Recommendations

The findings from the study have led to the following recommendations:

Support for engaging with technology needs to meet the requirements of the academic. Given the variance in terms of technology readiness and attitudinal groups (such as Explorers vs Sceptics), a one size fits all approach to training and support will not meet academic needs (Tondeur et al., 2019). Generalised training may be appropriate for introducing new academics to the technology environment, but training and support needs to be flexible to meet the varying needs of academics (Zhou & Milecka-Forrest, 2021).

The creation of safe spaces that enable academics to become familiar with technology, such as, online sandboxes (isolated environments that allow use of technology without affecting the program in which they run), or other low stakes trial environments, may provide space for academics to trial new technologies (Liu et al., 2020). This would allow nurse academics to explore technologies that could fit in their teaching practice without the risk of impacting

student learning. This reduces the risk of negative experiences and broadens the nurse academics frame of reference for possible technologies for teaching.

Institutes and disciplines of nursing within them should choose systems and technologies that are as simple and reliable as possible (Brown, 2016). Systems that are user friendly and lack steep learning curves will encourage engagement and use. There is also a need for back-up systems to be in place to allow for teaching to occur in the event of technology failure, for example, the inclusion of whiteboards as well as smartboards that would allow a nurse academic to teach even if the smartboard has technical issues.

Engagement with technology needs to be recognised in the academic workload (Reid, 2014). The additional time commitment that occurs when engaging with technology needs to be acknowledged and accounted for, to allow nurse academics to engage with technology without jeopardising other areas of their work (such as research).

As technologies are introduced or adapted, the benefits to student learning need to be clearly and explicitly discussed with nurse academics. Nurse academics value student learning and this will increase academic engagement with technology (Liu et al., 2020). This may also require nurse academics to be involved in decision making regarding technologies that affect their teaching so that concerns can be addressed prior to procurement and implementation of technologies.

Creation of formal and informal peer-to-peer technology support that is discipline based. This would allow for nurse academics to collaboratively find technologies that fit their teaching practice while also allowing for support that considers the nuances of nursing education (Belt & Lowenthal, 2020). This would supplement the support already recommended in this section.

Academics need to be willing to understand their attitude to technology and be willing to discuss and change their view on technology use in teaching. Regardless of TRI score or attitudinal groups, nurse academics must be willing to engage with technology, particularly if

their requirements are being met. As the nursing profession becomes more reliant on technology, so nursing education needs to reflect this and nurse academics will need to adapt to the ongoing changes in their teaching practice (Schwartz, 2019).

Implications

The overall TRI score and openness to technology within the interviews demonstrates that nurse academics were receptive to utilising technology in their teaching. This challenges ideas that academics are slow to adopt technology and requires researchers to consider the nuance of why academics may not embrace certain technologies (Liu et al., 2020). The combination of practical and theoretical knowledge required in nurse education provides ample opportunities for innovation with an academic group that is open to technology. Therefore, nursing as a discipline is well positioned to be an innovative space for technology in teaching.

The nurse academics in this study were dominated by three groups: Explorers, Sceptics and Hesitators. Given the TR groups identified in this study, having flexible approaches that cater for each group, may increase engagement. In addition, each group's attributes could also be exploited, for example; Explorers could be encouraged to experiment and Sceptics could be encouraged to evaluate if technologies are pedagogically fit for purpose. There may also be benefit from having diverse TR groups within institutes as this creates an environment where technology is viewed from differing perspectives and must demonstrate that it adds value to teaching (Petit dit Dariel et al., 2013). As per the recommendations above, there is also opportunity for peer-to-peer collaboration to occur. Future research should consider the nuances of attitudinal groups and how these affect technology adoption and engagement. From the findings of this study, the frame of reference of academics towards technology appears to play a role in their attitude to technology. Negative experiences, positive experiences or lack of experience appears to impact how the nurse academics perceive

technology (Liu et al., 2020). This underlies the importance of creating supported experiences with technology that allow academics to see how technology can benefit and fit within their teaching, as this would then affect their frame of reference.

The technology requirements of nurse academics found in this, and in previous studies, demonstrate that engagement with technology in teaching requires consideration of the kinds of technology used (Brown, 2016; Reid, 2014; Tzitzolaki et al., 2014). Technologies need to be simple to use and as reliable as possible in order for academics to engage with them, which forms part of this study's recommendations. These requirements were apparent across the TR groups, indicating this is a requirement, regardless of attitude to technology. Future teaching innovations need to consider these aspects to increase engagement. Academics have shown they are quick to abandon technology that does not meet their needs, making this aspect important for future technology innovations in nursing education (Shelton, 2017).

The student-centred approach of the participants in this study effects how nurse academics interact with technology. There was a clear preference for technology that was pedagogically sound, simple for students to use and added more value than previous ways of teaching. Technology in the teaching space needs to meet the needs of both academics and students. Academics may also need to adapt their teaching in order for the full benefits of technology to be realised, as traditional approaches to teaching may need to be adjusted when using technology (Sinacori, 2020; Sweeney et al., 2016).

As this study found no correlations between demographics and technology readiness, it contradicts the idea that younger generations are 'digital natives' (Allan et al., 2012). The attitude and ability of a nurse academic to engage with technology is more important than gender or age, and as such, these attitudinal attributes should guide decision making regarding training and support. Assumptions around demographics in terms of technology

use may in fact hinder engagement and should be discouraged. Rather, a focus on current abilities and attitudes, with support to develop academics from their current frame of reference, would support engagement with technology.

This study found technology support to be important to nurse academics, which is reinforced by the literature (Grainger et al., 2020; Reid, 2014). Support needs to be flexible and meet the needs of the varying levels of technology readiness within nurse academia. Although general technical support is required, the inclusion of learning designers, familiar with the nuance of designing and using technology to enhance learning, is also important. The study found that Explorers, Sceptics and Hesitators may have different frames of reference for technology. This may be due to a combination of their attitude and past experiences with technology, in either a healthcare or educational setting and, as such, a “one size fits all” approach may not work. As technology use increases in higher education, there must also be a matching increase in support. Lack of support may create negative experiences that colour an academic’s view of technology, impeding future technology use (Reid, 2014).

The finding of technology being time consuming and adding to workload is another implication that needs to be considered at an institutional level. This was a common finding from the literature and indicates the perception of technology as being time consuming, occurs across disciplines. However, there was evidence from previous research that if technology engagement was recognised in workload allocations, this created a more positive experience and led to higher adoption of technology (Gregory & Lodge, 2015). This indicates a need for the time-consuming nature of engagement with technology to be addressed and workloads adapted to accommodate engagement with technology in teaching, and forms part of the recommendations of this study. This may require further research into how much time and how to structure time allocations (when, larger/smaller segments, frequency) that allow for the most effective technology engagement.

This section has considered the recommendations and implications that arose from the findings of this study. Recommendations and implications were for both nurse academics and the institutes that employ them. The next section will discuss areas for further research.

6.6 Further Research

There are several aspects in this area that would benefit from further research. The impact of coronavirus disease (COVID-19), subsequent lockdowns and the “forced” shift to online learning, that occurred en masse in parts of Australia and internationally, is a worthy avenue for further study. The requirement for many academics to engage in online learning, some likely for the first time, would have increased exposure to the technologies that enable online learning. Academics were required to restructure their teaching in this environment, being heavily reliant on technologies that allowed for online learning. This may have a significant impact on attitudes to technology, as this study found use of technology and attitude were correlated. Although previous research suggests technology readiness is relatively stable over time, it remains unknown how modifiable attitudes to technology may be (Liu et al., 2020; Parasuraman & Colby, 2015). This is of particular interest given the impact COVID-19 and lockdowns have had on Australian universities, which shifted to online teaching during this time (Abdelkader & Barbagallo, 2022). Such a significant shift in teaching methods has likely had an impact on nurse academics’ attitudes to teaching technologies and is worthy of further research.

Similarly, the effect of time on TRI is a worthwhile further study. TRI is noted by its authors to remain fairly stable but does change over longer periods of time (Parasuraman & Colby, 2015). Follow-up studies at five and ten years may reveal changes in the TRI and TR group composition. Given that many nurse academics are approaching retirement, this may contribute to a change in demographic and technology attitudes in this cohort (Schwartz, 2019).

The TRI of Australian nursing students is an area for further research, given that they are the most impacted by change. Whether the nursing student TRI matches that of the academic TRI and the implications for teaching and learning, would be worthwhile avenues of study. Students' TRI across their years of nursing degree studies, given the increasing use of technology, may also change in ways that would require investigation.

The role of institutes in technology and teaching is also worthy of further exploration. Given that institutes were identified in this study as playing a part in creating a technology environment, whether that be beneficial or detrimental, it is worthwhile exploring how this eventuates. Institutes need to consider what academics require from them in order to feel supported and to create space for enthusiasm for technology in teaching. As technology becomes more prevalent in teaching, institutes may need to adjust their current models of work and recognition to align with new ways of teaching.

6.8 Conclusion

The aim of this study was to explore nurse academics' attitudes to technology and the influence attitude has on their use of technologies in teaching. TRI was measured and the results indicated that nurse academics were technology ready. They had higher TRIs compared to previous studies with laypersons, while this study's TRI scores were also found to be similar to previous studies with nurse academics, noting that this study used the TRI 2 (compared to the original TRI survey). New insights were gained by utilising the TR groups, which is unique to this study. TRI was associated with frequency of technology use, the number of technologies used and self-reported confidence in using technology. This indicates that attitude is a moderator for engagement with technology. Importantly, demographic characteristics appeared to play no role in attitude to technology.

Thematic analysis of the qualitative data explored why and how academics engaged with technology. Reasons for using technologies in teaching were highly student-centred and focussed on engagement, communication and assessment. Further to this, academics revealed the nuance of their attitudes to technology; they were overall open to using technology in teaching but based on specific requirements; technology needed to add value, be simple and reliable and that technical support be available.

The integrated findings demonstrated that although there were three unique groups, Explorers, Sceptics and Hesitators, with unique attributes, there were similarities between these groups. Explorers were enthusiastic about technology, displaying innovation and confidence in their abilities to adopt technology, Sceptics were unsure of technology, particularly in terms of the impact on pedagogy and interpersonal skill development, while Hesitators displayed low innovation and displayed high distrust and anxiety in relation to technology. However, deeper exploration revealed that there were commonalties, even between the Explorers' positive and Sceptics' negative attitudes. Both these groups felt supported and would "have a go" at technology, even if their requirements for engagement were not met, while Hesitators shared the same enthusiasm for technology as Explorers, despite being less innovative. Importantly, students were at the centre of the groups' attitudes to technology, expressing a desire for technologies to be of benefit to the student. Attitude to technology is nuanced and complex, interconnected with the technology itself and the individuals frame of reference.

The importance of nurse academics' utilisation of technology in their teaching cannot be understated. As technology becomes more prevalent in the nursing profession and healthcare settings, familiarity with it is an essential aspect of nursing education. The Educating the Nurse of the Future Report (Schwartz, 2019) encourages educators of nurses to prepare students for a technology-rich healthcare environment. The current study found that nurse academics had requirements that must be met to encourage their technology

engagement. Simplicity, reliability and support were essential aspects for increasing nurse academic engagement with technology. Encouragingly, the nurse academics were found to be highly student-centred in their approaches to technology, considering the impact on students, how to engage students and the pedagogical needs of students. They were aware of the potential for technology to enhance teaching.

Academics need to understand their attitude to technology and be willing to discuss and change their view on technology use in teaching. Regardless of TRI score or attitudinal groups, nurse academics must be willing to engage with technology, particularly if their requirements are being met. As the nursing profession becomes more reliant on technology, so nursing education needs to reflect this, and nurse academics will need to adapt to the ongoing changes in their teaching practice.

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Appendices

Appendix A. Quantitative literature summary table

Authors	Title	Aim	Sample	Method	Findings	Critique	Score
Hampton, Culp-Roche , Hensley, Wilson, Otts, Thaxton-Wiggins, Fruh and Moser (2020), USA	Self-efficacy and Satisfaction with Teaching in Online Courses	To examine the level of teaching self-efficacy and satisfaction of online nursing faculty.	100 participants (nursing faculty) from 6 colleges across the US (southwest, southeast, and central)	Cross-sectional study. Survey consisting of two combined tools: Online Instructor Satisfaction Measure (OISM) instrument, the MNESEOT instrument, Previously validated survey, expert review for validity of survey Cronbach's alpha of .93 for the total scale and .80 or higher for the subscales.	Faculty in this study had a moderately high level of satisfaction with teaching in online courses. Years of teaching did not impact online teaching satisfaction in this study. Institutional support was 1 of the 2 lowest subscales of instructor satisfaction Teaching efficacy in the online environment was correlated with faculty satisfaction.	six HEIs represented, high response rate (34%) survey tested for reliability and validity large number of items in survey, more than 50 participant selection bias (faculty who had already taught at least one online course)	9/10

Howe, Chen, Heitner, and Morgan (2018), USA	Differences in Nursing Faculty Satisfaction Teaching Online: A Comparative Descriptive Study	To examine differences in satisfaction levels between nursing faculty who have and have not received support services to teach online	185 nursing faculty (from 15 randomly selected states)	cross sectional, comparative and descriptive study, The Faculty Satisfaction Teaching Online (FSTO) 19 item instrument (Howe, 2015), expert panel validation of tool, Cronbach's alpha of 0.941	No significant difference in faculty satisfaction with teaching online between groups on the basis of the number of years teaching face to face. Nursing faculty who taught more than 20 courses fully online had a statistically significant higher satisfaction level than those who taught only one to five courses. A higher and statistically significant difference was observed in satisfaction between nursing faculty; who received mentoring; received release time; received technical support for software and hardware; who received technical support for the (Learning Management system) LMS; than those participants who did not receive the above.	large number of participants drawn from large pool representing many areas of the United states survey power determined clear description of statistical analysis Excluded nurses who taught hybrid or blended courses survey tested for reliability and validity	10/10

Broussard and Wilson (2018), USA	Nursing Faculty Attitudes and Practices Related to Online Teaching	Understanding the online practices that nurse faculty engage in and their attitudes and beliefs related to teaching online	58 nursing faculty (convenience sample of faculty from three universities)	Cross sectional survey. A survey developed by the Babson Survey Research Group was utilized to determine faculty attitudes about various aspects of online education. Prior validated tool.	Online textbooks were required by 5 percent of faculty, whereas 45 percent offered them as an option. Simulations and videos were used by 50 percent of respondents; digital materials used less frequently included streaming in class instruction (10 percent) and lecture capture and other miscellaneous resources (17 percent). 14 percent of faculty surveyed reported using social media to communicate with students. A greater percentage (25 percent) reported using social media to communicate with colleagues. 55 percent of respondents believed online courses offer the same learning outcomes as F2F courses, whereas 70 percent believed blended/hybrid courses offer the same outcomes.	Small sample size from three sites (41 percent respondent rate) survey not tested for reliability and validity (although previously validated) descriptive survey	7/10

Ali, Ali & Jones (2017), USA	High Level of Emotional Intelligence (EI) is Related to High Level of Online Teaching Self-Efficacy among Academic Nurse Educators	To investigate the relationship between EI and online teaching self-efficacy among academic nurse educators.	115 surveys, nurse educators (online, blended or both)	cross sectional survey Emotional intelligence was measured by Schutte et al. tool (1998) Online Teaching Self-Efficacy scale (OTSES) a modified General Self-Efficacy scale (Schwarzer & Jerusalem, 1995). Both tools previously validated overall survey Cronbach's alpha of 0.867	Significant positive correlation found between EI and online teaching self-efficacy Online teaching self-efficacy was related to duration of being an academic nurse educator and duration of teaching online. Neither self-efficacy beliefs nor EI were significantly different by the age groups of participants	Self-efficacy focussed several sites survey tested for reliability Survey not tested for validity (although previously tested)	8/10

Roney, Westrick, Acri, Aronson, and Rebeschi (2017, USA	Technology Use and Technological Self-Efficacy Among Undergraduate Nursing Faculty	to explore faculty responses to a survey about using technology to teach undergraduate nursing students. to identify the intrinsic and extrinsic factors that influence a sense of technological self-efficacy for nurse faculty	272 participants (nursing faculty who teach at Commission on Collegiate Nursing Education–accredited nursing programs.)	descriptive correlational design Instruments used were the Roney Technology Use Scale (RTUS), and the Technology Self-Efficacy Scale (TSS). RTUS Cronbach's alpha = 0.741, TSS Cronbach's alpha = 0.62. Expert panel reviewed the survey for validity.	positive, weak relationship between age and technological self-efficacy ($r = .127$, $p < .05$). No other significant relationships between demographic variables and technological self-efficacy emerged. Although half of the participants in the current research study meet one-on-one with a technology support person to use and integrate technology in their teaching of nursing students, many state that most of what they learn is on their own. Moderate technology use was reported for those participants who only taught classroom theoretical content. Participants who taught in both the classroom and in the clinical setting reported high technology use.	self-efficacy focussed large sample size homogeneity of sample prevented some testing of technology self-efficacy sampling method favoured schools with multiple campuses (increasing their representation within the sample) survey tested for reliability and validity	9/10

Kotcherlakota, Kupzyk and Rejda (2017), USA	Years of Experience as a Predictor of Nurse Faculty Technology Use	to describe nurse faculty preferences about the use of technologies and to examine relationships between their preferences and years of experience.	118 participants (nursing faculty members from a midwestern U.S. nursing college)	A multiple cohort design. Educause Center for Analysis and Research (ECAR) survey conducted in 2014 and 2015 previously validated tool	decrease in attitudes about online learning helping students to learn more effectively between two surveys (2014 and 2015). This may be due to faculty becoming weary of using online learning, or simply continued problems with technology. negative relationships observed between years of faculty experience and attitudes toward the value of obtaining increased skills for technology. Faculty with less years of experience were more likely to see the value in becoming better skilled at technology integration in their curriculum. Newer faculty were more likely than experienced faculty to have positive attitudes and motivation for newer technology use and adoption.	comparison across two years (2014-2015) not a large gap in time few changes across the two years single HEI but multi-site (5 sites) independent samples (rather than paired longitudinal) study lacked reliability or validity testing of the survey tool Survey tool did not record age (only experience)	8/10

Richter and Idleman (2017), USA	Online Teaching Efficacy: A Product of Professional Development and Ongoing Support	to investigate the perceptions of online teaching efficacy of nursing faculty who teach courses in which 51 % or more of the content is offered online.	59 participants (nursing faculty), convenience sample comprised of nursing faculty at 12 public institutes	Cross sectional study. Survey (The Michigan Nurse Educator's Sense of Efficacy), The overall survey Cronbach's alpha was 0.95. Previously validated tool	No significant correlations between online teaching efficacy (four scales and overall) and age or experience. No differences found in self-efficacy among different ranks of faculty. Nursing faculty who had taken a seminar in teaching online (n = 43) had significantly higher efficacy scores in student engagement, instructional strategies, computer use, and overall efficacy. Similar results were found for faculty who received release time to develop online courses. Time was expressed as a critical element for successful online teaching. Faculty noted that their institution did not recognize the need for course release time for development of online courses Faculty reported the use of technology as challenging, frustrating, and overwhelming. Having an online teaching support centre for faculty development on campus as well as access to an instructional designer was reported as invaluable.	low sample number (represented 14 sites), Pilot study Respondents results indicated they did not meet inclusion criteria (51% online) lack of analysis of open ended questions survey tested for reliability no validity testing (previously validated tool)	9/10

Gonen and Lev-ari (2016), Israel	The relationship between work climate and nurse educators' use of information technology	to examine the perceptions of academic nurse educators about their work climate, concerning the use of information technology (IT)	109 participants (nurse lecturers) from 10 HEIs	Cross sectional Survey developed from two sources Survey from Shoham and Gonen's (2008) study: work climate, subjective norms, self-efficacy and innovativeness. Nurses' Attitudes toward Computerization questionnaire (Stronge and Brodt 1985). Previously validated surveys were used. The surveys Cronbach's alpha of work climate 0.76, attitude to It 0.89, innovativeness 0.78, self-efficiency 0.47 and actual It use 0.83 variance.	Positive correlations between innovativeness, attitudes, self-efficacy, and intentions emerged, meaning that the higher the innovativeness, the more positive the attitudes, the higher the sense of efficacy, and the more intention there is to use IT. Positive correlations also emerged between innovativeness and actual use of IT. Positive attitudes toward using IT, and sense of self-efficacy, were both also positively correlated with actual use of IT. Age, seniority and work climate did not predict actual use of IT.	work climate focussed medium sized sample (response rate 72.5%) Actual use of IT measured rather than intent to use All survey tools were tested for reliability no validity testing (previously validated tool)	8/10

Burke and Ellis (2016), USA	Electronic Health Records: Describing Technological Stressors of Nurse Educators	to describe the technological stressors that nurse educators experienced when using electronic health records (EHR) while teaching clinical courses.	64 participants (nursing lecturers), multisite but unclear how many sites	Cross sectional survey (Nurse Educator Technostress Scale (Revised) (NETS)), previously validated and reliable tool, Cronbach's Alpha of 0.95	Nurse educators experienced mild to moderate technological stress while teaching clinical courses as indicated by a mean NETS score of 2.86 (SD, 0.93). The NETS item with the highest mean was ‘‘student access to EHR training materials’’ (mean, 3.31 [SD, 1.21]). The need to learn new EHRs was the second highest rated item causing technostress (mean, 3.16 [SD, 1.14]). demographic variables found no statistical significance to technostress	Focus on single technology (EHR) and technostress small sample size (23% response rate) Reliability of survey tested no validity testing (previously validated tool)	7/10

Tacy, Northam, and Wieck (2016), USA	Understanding the Effects of Technology Acceptance in Nursing Faculty: A Hierarchical Regression.	To exam the effects of nurse faculty technostress, perceived usefulness, ease of use, and attitude toward using technology on use, job satisfaction, and intent to leave teaching.	1017 participants (nursing faculty) from the Southern Regional Education Board (SREB) member nursing schools	A correlational survey methodology was used and included five combined instruments: demographic information, Nurse Educator Technostress Scale (NETS), Technology Acceptance questionnaire, the Attitudes Toward Elearning tool (ATEL), Job in General, and the Job Descriptive Index. Expert panel used to validate tools All tools used achieved Cronbach's alpha above 0.9	Technology use was predicted by lower levels of technostress and higher levels of perceived usefulness, perceived ease of use, attitude toward using, and behavioural intention to use. Perceived usefulness, attitude toward using, and system use positively predicated job satisfaction, while technostress negatively impacted job satisfaction. Technostress was found to be a weak predictor for technology use and job satisfaction and irrelevant with intention to stay in the profession. Technostress negatively influenced technology use among nurse faculty	large sample very long survey (195 items) job satisfaction and intent to stay not nursing related (generalised survey) survey tested for reliability and validity	9/10

Buxton, Buxton and Jackson (2015), USA	Hybrid and Flipped Strategies in a Blended RN-BSN Program: Determining Student and Faculty Perceptions	To examine if faculty teaching in a hybrid and flipped classroom program format perceive benefits in providing this form of instruction, increased flexibility of their time, and increased proficiency in their technology skills.	12 participants (nursing faculty)	cross sectional survey, Survey with open and closed questions Expert panel review for validity	Faculty were satisfied with this format (hybrid/flipped) and the support given and are likely to use the hybrid/flipped format again. Essential experiences for teaching hybrid: computer skills, time management, communication, and facilitation skills. Essential experiences identified by faculty included previous experience teaching in both a face-to-face and online classroom environment	small sample size survey not tested for reliability survey tested for validity focus on hybrid teaching	7/10

Abell & Garrett-Wright (2014), USA	E-Books: Nurse Faculty Use and Concerns	to identify nurse educators' stage of concern regarding e-books and examine relationships between stage of concern and demographic variables.	50 nurse educators	A descriptive, cross sectional design, Data were collected using a demographic questionnaire and the Stages of Concern (SoC) questionnaire. SoC previously validated Overall survey had Cronbach's alpha of .86	The use of e-books was noted to be greater among participants who indicated some formal training. No statistical significance was seen between the first and second highest SoC with age or experience.	focussed on Stages of Concern focussed on single technology participants likely represented multiple sites (unclear how many sites represented) convenience sample from single state nursing conference may introduce selection bias survey tested for reliability Survey not tested for validity (although previously validated)	8/10

Tzitzolaki, Tsiligiri and Kostouda (2014), Greece	The Use of Information and Communications Technology from the Educational Staff of the Nursing and Physiotherapy Departments of the Alexander Technological Educational Institution of Thessaloniki, Greece	to investigate the opinions of the educational staff about the ICT tools and explore which factors influence the use ICT tools by the educational staff.	90 participants (both nursing and physiotherapy faculty) of the Nursing and Physiotherapy Departments of the Alexander Technological Educational Institute of Thessaloniki (ATEITH).	Cross sectional study. A self-report questionnaire with closed type questions on Likert scale was used. The survey had Cronbach's alpha of 0.79	The gender was not associated with the use of ICT tools Age did not influence the use of ICT tools from the tutors The tutors who had received some type of training on the integration of ICT tools in their teaching used them more frequently compared with those who had not. increase of available technical support was associated with increase in the use of ICT tools . It was observed that the increase in availability of time correlated with an increase use of ICT tools. A statistically significant positive correlation was detected between the available technical infrastructure and the use of the ICT tools.	very focussed on type of technology used (no attitude), single site combination of nursing and physiotherapy departments (although no statistical difference between specialities was found) some very broad ICT uses (PC, windows), survey reliability tested Validity testing of the survey not reported	9/10

Fernández-Alemán, García, Montesinos, Marqués-Sánchez, Darkistade znd Rivera (2014), Spain	Exploring the use of information and communication technologies and social networks among university nursing faculty staff. An opinion survey	To identify what technologies are employed and for what purpose; learn what formation the university nursing professors have acquired on ICTs; to investigate what types of cooperation networks the professional professors create to share their knowledge to improve the quality of teaching and research.	165 participants (university professors who carry out their professional work in Nursing Faculties of Spanish higher education institutes)	cross sectional survey, questionnaire Cronbach's alpha 0.85. additionally, a pilot test (using 35 people representative of the target population) was conducted for validity	professors do not perceive that the application of ICT allows them to have more time for other tasks. a negative correlation between age and the number of devices (lap-top computer, tablet, etc.) used in the teaching practice was found (pearson's -0.12, $p<0.05$) professors who taught into postgraduate level courses (Masters or PhD) had higher likelihood of using ICT than undergraduate courses	survey focussed on use of ICT (rather than attitude), survey tested for reliability and validity, some survey items unclear (possibly due to translation from Spanish)	9/10

D'souza, Karkada, and Castro (2014), Sultanate of Oman	Exploring elearning among nurse educators in undergraduate nursing	explore the use of elearning and satisfaction using Moodle (elearning) for teaching-learning among nurse educators in undergraduat e curriculum in the Middle east.	50 participants (nurse educators) from a public university	cross sectional Survey, Teaching-learning readiness tool (TLR), Teaching Learning with Technology Tool (TLT), Faculty satisfaction survey (FSS) developed by Bolliger and Wasilik, power analysis for sample size performed. Cronbach's alpha coefficient for the TLT, TLR and FSS instruments was 0.71, 0.73 and 0.86 respectively. overall survey validated by expert panel.	Nurse educators reported developing Moodle course content, guidance, networking and information technology skills influenced their readiness and satisfaction using Moodle. Lack of confidence, time and work load, technical support, hinders readiness to use elearning. Participants were concerned with: student's high expectations using Moodle, need for higher range of elearning resources, technical support, time management. Age, qualification, number of students, number of courses using Moodle and satisfaction using Moodle was found to be significantly ($P<0.05$) with faculty satisfaction (no direction given).	small sample (although represented all available population), single site, reliability tested, large survey (more than 60 items, combining 3 surveys), unclear if satisfaction represents overall satisfaction or technology satisfaction	8/10

Yu, Wang and Lin (2013), Taiwan	Nursing Faculty's Evaluations of Technology Integration into the Instructional Setting	To assess teachers' perceived expertise in using word processing, spreadsheet, and presentation software applications to facilitate instruction	313 participants (nursing faculty who taught primarily undergraduate classes)	cross sectional study. Survey identify participants' perceptions of technology integration into the instructional setting. test, retest with a correlation coefficient of .78 Cronbach's alpha was = 85, p. ≤ .05. Expert panel validation of survey	T-test showed that female participants reported significantly higher levels of competence that males in five (question items 1, 3, 5, 6 & 7) of the ten areas of word processing. No differences based on gender for any questions in the presentation and spreadsheet applications. ANOVA analyses suggested that the younger teachers, aged 20-25, had significantly higher scores for technology integration than those teachers aged 56+.	single site, Large sample overly focussed on word processing, presentation and spreadsheet software use (small part of technology for teaching) survey validated and reliability tested,	9/10

Nguyen, Zierler and Nguyen (2011), USA	A Survey of Nursing Faculty Needs for Training in Use of New Technologies for Education and Practice	To assess nursing faculty's perceived knowledge, skills, and needs for training in the use of technologies for nursing education and practice.	193 participants (nursing Faculty from the Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI) region),	descriptive, cross-sectional survey design. The survey had four sections: Demographic and teaching characteristics, Current use of four technologies (distance learning, simulation, telehealth, and informatics), Perceived knowledge and skills for using the technologies, and Training availability and needs. Face validity by expert panel	Ratings of perceived knowledge and skills paralleled frequency of technology use. Two thirds of respondents were at least competent with distance learning and informatics tools. training and technical support for distance learning tools were highest, yet a large percentage of respondents still felt a need for additional training in using these tools. Age not associated with use of distance learning tools Availability of training as well as financial and technical support were associated with greater use of distance learning tools.	focus on four aspects of technology (distance learning, simulation, telehealth, and informatics) multi-site lack of reliability testing of survey survey tested for validity	8/10

Robinia and Anderson (2010), USA	Online teaching efficacy of nurse faculty	to examine variables that affect nurse faculty self-efficacy levels and participation in online teaching	140 participants (nurse educators from the state of Michigan)	cross-sectional design using a survey (The Michigan Nurse Educator's Sense of Efficacy) Validity of the survey performed by expert panel and pilot survey. Cronbach's alpha of 0.93	Overall strong levels of self-efficacy for online teaching. no impact on self-efficacy by demographics (gender, rank, age, years teaching nursing). A medium to large significant effect between teaching an entire online course and online teaching efficacy levels. preparation experiences associated with significantly higher online teaching efficacy scores.	Focus on self-efficacy (sense of ability to perform a behaviour to achieve an outcome) multi-site survey tested for validity and reliability	10/10

Appendix B. Qualitative literature summary table

Authors	Title	Aim	Sample	Method	Findings	Critique	CASP score
Nabolsi, Abu-Moghli, Khalafc, Zumot & Suliman (2021) Jordan	Nursing faculty experience with online distance education during COVID-19 crisis: A qualitative study	to explore the first experience of nursing faculty members with online distant education (ODE) within the context of COVID-19	two focus groups (n=15)	A qualitative descriptive design guided by a phenomenological approach	four thematic findings resolving immediate reaction to ODE - focussed on the abrupt change to online teaching that the pandemic caused managing the challenges of ODE - discussed the lack of expertise and lack technical support as well as lack of infrastructure for ODE ODE defeated geographic and time barriers but interrupted personal time management - participants noted the increased time required for ODE but noted it revealed new ways to teach Insufficiency of ODE - discussed the limits of ODE to achieve clinical learning outcomes and the lack of professional and interpersonal skill development that occurred with ODE	COVID impact focussed clear method of analysis two sites independent coding compared (two researchers) member checking of themes with some participants	9/10

Alves, Cesar, Martins, Ribeiro, Oliveira, Barbosa and Moraes (2020), Brazil	Information and communication technology in nursing education	To analyse the use of Information and Communication Technologies (ICTs) by nursing professors in the teaching and learning process	22 participants (nursing professors)	Qualitative study using Straussian grounded theory	lecturers associated ICTs with learning and recognized continuing education as an important factor for improving pedagogical practices. Lack of practice using digital tools was a limitation for teaching practice. Poor lecturer training in relation to pedagogical practices affects the use of social networks as a teaching method There was a lack of ability of teachers to deal with technology and to associate it with the content of the subjects.	six HEIs represented 3 researchers reviewed coding clear, explicit coding framework, category-subcategory-code and verbatim participant quotes in results	9/10

Porter, Barbagalloa, Peck, Allen, Tanti and Churchill (2020), Australia	The academic experiences of transitioning to blended online and digital nursing curriculum	to explore the experiences and perspectives of academics involved in the development and implementation of an inaugural BOLD (Blended, On-Line and Digital) Bachelor of Nursing curriculum	11 participants (nurse academics, five focus groups).	qualitative thematic analysis of focus group interviews	The theme 'Get Ready' acknowledges the need for academic staff to have sufficient opportunity to prepare for the transition. inadequate time to prepare and review work prior to implementation created a barrier to implementation. Academics considered having access to an online development expert as an essential component of 'getting ready' for the transition to an online and blended learning space. In the 'Get Set' phase of the journey participants began to raise concerns about how one might go about engaging a student enrolled in the online mode of delivery. Academics reported a lack of understanding of the pedagogy that surrounds BOLD and felt a lack of organisational support while attempting to understand the effective use of technology.	single HEI (although two sites) implementation rather than review of technology small sample size	9/10

Sinacori (2020), USA	How nurse educators perceive the transition from the traditional classroom to the online environment : a qualitative inquiry	to explore the experiences of nurse educators who transitioned from traditional classroom to an online learning environment, either 100 percent online or in hybrid courses.	8 participants (nursing faculty) from Seventeen nursing programs in New Jersey.	Qualitative semi-structured interview	Nurse educators experienced challenges including a need for professional development for learning a new pedagogy and learning management system, technological support, mentorship in transitioning to the new mode of teaching, and a mind shift in teaching to a different pedagogy. nurse educators identified the online environment differs from the traditional classroom, which involves a mind shift in pedagogy. Mentorship by nurse educators with prior experience as online educators is recommended.	Focus on transition (change) more than technology itself combination of hybrid and online unclear data analysis unclear rigour semi-structured interview was field tested by three independent nurse academics	7/10

Stec, Smith & Jacox (2020), USA	Technology enhanced teaching and learning: exploration of faculty adaptation to iPad delivered curriculum	to examine faculty members' perceptions of factors influencing the integration of iPad devices into curriculum 4 years after its implementation.	14 participants (nursing faculty, 2 focus groups)	Descriptive, qualitative study by focus groups with descriptive content analysis	Three main domains: Student Attributes, Faculty Attributes, and Device Capabilities. Student attributes: Student learning style, Student request for iPad content, Student learning curve, Distraction, Cost of the device. Faculty attributes: Ability to roam free, Engaging student in active learning, Airplay for sharing, Use of instructional designers, Inconsistent use, Use of iPad in clinical area Device capabilities: Content delivery, Student access to resources, Accessibility, iBooks, Apps, ExamSoft, iTunes U, Device updates, Compatibility with Learning Management System (LMS),	focussed on singular technology (iPad) study conducted four years post implementation rigour and trustworthiness well discussed discussion making trail kept co-researcher review of transcripts investigators (3) triangulation for the final themes	9/10

Smith and Crowe (2017), USA	Nurse educator perceptions of the importance of relationship in online teaching and learning	Understand the perceptions of teaching nursing students in online environments as experienced by nursing educators who have been teaching online for a minimum of 2 years	10 participants (full-time nurse educators), sourced via survey from across the USA	interview-based qualitative descriptive design	Nurse educators saw student engagement as both essential to student learning and a challenging aspect of teaching online. Fostering student engagement and learning in the online classroom as an important focus. Participants knowledge of their students needs and response to those needs, helped to build a success online learning environment Most felt a loss of the ability to "know" their students by teaching online (compared to face-to-face teaching) Recommend structured mentoring for faculty new to online teaching	highly focussed on the relational aspects of online teaching participants were both online and hybrid Verbatim participant quotes supported themes	10/10

Gazza (2017), USA	The experience of teaching online in nursing education	To understand what it is like to teach online in nursing education.	14 Participants (nursing faculty) who completed at least 50% of their teaching workload assignment in fully online courses in baccalaureate, master's, or doctoral nursing programs.	Hermeneutic phenomenology study included Data were collected through the use of a demographic questionnaire and personal interviews	Four themes emerged from the data, including (a) Looking at a Lot of Moving Parts, (b) Always Learning New Things, (c) Going Back and Forth, and (d) Time Is a Blessing and a Curse. The wide range of technical abilities of students in an online course was concerning. Participants described how they learned new tools and approaches to teaching, including the use of new technology, software, and teaching strategies. Learning about and how to use these approaches was an ongoing process. Participants spoke about the time required to teach online. Teaching fully online courses required time and took place during undefined hours and in undefined spaces. The time involved in online teaching included the time needed to prepare and deliver courses, to be accessible and available to students, to read and respond to submitted student assignments, and for one-on-one interactions with students.	online focussed clear description of qualitative methods data analysis clear and transparent	8/10

Sweeney, Kirwan, Kelly, Corbally, O Neill, Kirwan, Hourican,Matthews and Hussey (2016), Ireland	Transition to blended learning: experiences from the first year of our blended learning bachelor of nursing studies programme	To document the experiences of the academic team making the transition from a face-to-face classroom delivered programme to the new blended learning format.	8 participants (full-time nursing lecturers, two focus groups)	Qualitative semi-structured interview with thematic analysis	Five dominant themes were identified: Staff Readiness; Student Readiness; Programme Delivery and Student Engagement; Assessment of Module Learning Outcomes and Feedback; and Reflecting on the First Year and Thinking of the Future. Making the transition from face-to-face delivery to blended learning involved significant front loading of work. This led to heightened stress levels for some academics. Academics expressed confidence in their knowledge of their subject matter but were not as confident about how to communicate it remotely or by use of elearning approaches. Academics were concerned that the interpersonal relationship in the traditional face-to-face classroom could be lost in the technological delivery. Very strong theme of peer support for the programme team. The value of peer teacher to teacher sharing of modes of content delivery and experiences emerged as important in resource terms and time sparing and not simply for collegial or morale support. Staff noted fear and apprehension and lack of readiness to use the new technology.	focus on transition single site small sample yet all possible participants (given inclusion criteria) two researchers independently verified themes verbatim participant quotes supported themes	8/10

Wingo, Peters, Ivankova & Gurley (2016), USA	Benefits and challenges of teaching nursing online: exploring perspectives of different stakeholders	To explore the benefits and challenges of teaching nursing courses online by exploring the perspectives of faculty, administrators, and instructional designers at three schools of nursing in the south-eastern United States.	Three nursing faculty members (N = 9), two administrators (N = 6), and two instructional designers (IDs) (N = 6) from each site, total of 21 participants.	The study used a multiple-case study design (Yin, 2014) with each case bounded by a participant group: (a) faculty teaching online at three schools of nursing in the South Eastern United States, (b) administrators at the schools of nursing where these faculty members taught, and (c) staff members who work with faculty members on instructional design	Nursing faculty commented that they sometimes felt disconnected from students and had to work especially hard to be sure they were communicating effectively. Many faculty participants were enthusiastic about teaching online because it had forced them to learn new ways to engage students with course content. They also explained that providing multiple ways to meet the needs of students was challenging, yet rewarding, especially because it created a more student-centred environment. a lack of boundaries in terms of time and space sometimes created problems for faculty. The ability to work anywhere at any time could result in unreasonable expectations for instructors. Some faculty expressed concern that they were devoting so much time to teaching online that they might not be able to fulfill other obligations. Participants particularly emphasized the value of skilled IDs who could provide one-to-one support as instructors designed and delivered online content. Faculty varied in how much training they received for teaching online. Even though most faculty expressed some need for training, they were not particularly enthusiastic about training programs, mainly because those programs offered a one-size-fits-all approach rather than addressing individual needs.	three sites focus on admin and instructional design as well as faculty, low number of faculty (n=9), member checking and triangulation across participant groups audit trail and bias bracketing used Some mixing of group responses but academic voice clear and faculty group clearly identified.	8/10

Kowitlawakul, Chan, Wang and Wang (2014), Singapore	Years of experience as a predictor of nurse faculty technology use	Explore the experiences and perceptions of nursing faculty members using electronic health records for nursing education (EHRNE) software program, and to identify the influential factors for successful implementation of this technology.	Seven faculty members participated in the study	Exploratory qualitative study using individual interviews	participants found EHRNE: challenging to use, unconvinced it would be useful, very time consuming and created a larger teaching workload. participants valued the EHRNE software because at the end of the lesson the students had a chance to document the health data, which made the lesson more comprehensive. Participants had similar perceptions regardless of years teaching (range 2-10). Participants suggested that more time should be allocated to each educational session when integrating EHRNE into teaching, due to the time consuming nature of EHRNE.	focussed on single technology (Electronic health record) single site member checking of transcripts triad of researchers who reviewed data analysis independently	9/10

Petit dit Dariel, Wharrad and Windle (2014), UK	Using Bourdieu's theory of practice to understand ICT use amongst nurse educators	To provide a practical example of how Bourdieu's theory of practice can be employed to better understand nurse educators' responses to ICT	Bourdieusian case study of one division of nursing in one Higher Education Institution (HEI), using previous data from 38 nursing faculty	Bourdieusian case study	Despite significant investments made in promoting ICT at HEI, the nurse educators in three of the four Q-Factors did not think enough had been done to support staff. Different interpretations that can be made of institutional "support" and what constitutes appropriate "incentives". HEI perceived support as infrastructure, equipment and training (implementation) whilst staff interpreted the concept more ambiguously, relating it to institutionally-recognised and valued forms of capital. If capital is attributed primarily to research activities, this creates little incentive for staff not intrinsically motivated to take time out to rethink teaching practices.	high focus on methodology focus on elements external to the individual single HEI (but multi-site) Case study of school rather than individual (however nursing faculty data used)	10/10

Freed, Bertram and McLaughlin (2014), USA	Using lecture capture: A qualitative study of nursing faculty's experience	understand faculty's experience of using a new lecture capture system.	14 participants (nursing faculty)	modified version of Krueger's (1998) systematic qualitative approach using focus groups (n=4)	The experience of learning the new technology was described as being unsettling, anxious and unanticipated. Using lecture capture was an anxiety-laden experience that ignited concerns about being judged by technologically savvy students. Lecture capture is described as an unwanted, unwelcome presence that may interfere with the connections made with students in the classroom and might ultimately threaten them as teachers. Faculty felt that their privacy might be breached and that their security might be threatened. Participants generally appreciated that captured lectures would “supplement classroom teaching through repeated access” and that students valued them for study. Faculty needed to learn new behaviours in order to use the technology and to alter old teaching habits in how they presented or revealed themselves to students in classroom dialogs.	single technology focussed (lecture capture) single site lecture capture technology is fairly common now participant voice apparent in results (through verbatim quotes)	9/10

Allan, O'Driscoll, Simpson and Shawe (2013), UK	Teachers' views of using e-learning for non-traditiona lstudents in higher education across three disciplines [nursing,che mistryandm anagement] at a time of massificatio n and increased diversity in higher education	To describe teachers' views of using elearning for non-traditional students in higher education across three disciplines	3 Focus groups (7 nursing lecturers in total)	Qualitative study with Focus groups based on discipline. Thematic analysis of focus group transcripts.	Teachers in Nursing felt they wanted more support from within the sector to improve teaching and learning through elearning generally. Nursing faculty greatly overestimated the proportion of 'digital natives' amongst their students. Nursing faculty rarely distinguished between those students who might be comfortable with computers and elearning, and those students who were not comfortable with either, or one or the other. nursing faculty felt supported by the university to invest time in improving teaching and learning through the use of elearning. In the nursing (less experienced) focus group, teachers expressed a lack of confidence in using computers generally and in using elearning in particular.	several groups (not just nursing focussed), nursing groups identifiable single site selection bias (participants self-selected in study and into more or less experienced with technology groups) little discussion of attempts for rigour participant voice apparent in results (verbatim quotes)	7/10

Jokinen and Mikkonen (2013), Finland	Teachers' experiences of teaching in a blended learning environment	To describe teachers' experiences of planning and implementing teaching and learning in a blended-learning-based adult nursing programme.	three focus groups, each with four to six participants,	Qualitative study. Focus group interviews. The data were analysed using qualitative content analysis.	Nine themes emerged from the data to describe teachers' views about planning and implementing teaching in a blended-learning based adult nursing programme. collaborative planning; integration; student group; face-to-face teaching; online learning; learning activities; teaching and learning methods; learning in and about work; and confirming competences. Collaborative planning was seen to support integration of technology as well as developing expertise Wide variation on how participants used the online space for learning Participants noted they had to change their pedagogical approach to teaching for the online environment	small tightly defined sample (one site, only teachers who had taught in the first year of the new program) interviewer part of teaching faculty (potential for bias or influence) peer review of data coding themes well supported by participant quotes	9/10

Petit dit Dariel, Wharrad and Windle (2013), UK	Exploring the underlying factors influencing e-learning adoption in nurse education	to explore the underlying factors influencing elearning adoption in nurse education.	38 participants (nursing lecturers)	Q-sorts and post-sort interviews. The Q-sort data were factor analysed and the interviews were coded to their respective factors to develop in-depth narratives. Expert review of Q set, pilot study (n=10) for face validity	Four factors were identified: 'Elearning advocates' saw elearning's potential to improve nurse education and prepare future nurses for their evolving role; 'Humanists' had avoided elearning because they valued human interaction; 'Sceptics' doubted that technology could improve learning outcomes; 'Pragmatics,' only used elearning as a tool to post lecture notes online to supplement what they covered in class. Although nurse academics frequently identify a lack of time and training as barriers to adopting elearning, a deeper examination points to underlying issues influencing their response not to make time to access training. Not adopting elearning is not an act of 'resistance' by Luddites and technophobes, rather it is a justified response to the perceived pedagogical needs and experiences of nurse educators.	Q methodology used (complex) single HEI (although multiple sites used) Q sets relies on literature of which there is little regarding nursing Audit trail kept	10/10

Sword (2012), USA	The transition to online teaching as experienced by nurse educators	To explore the perceptions, experiences, and needs of nurse faculty as they transition from traditional classroom instruction to an online teaching environment.	20 participants (nurse faculty) from seven college/university schools of nursing in the Midwest	Phenomenological study with a modified heuristic approach	The amount of time needed to teach in the new environment was the predominant theme with preparation time described as essential. Technology was described as intimidating, with more support and training needed. Faculty engaged in self-questioning about the appropriate delivery of course content to students. Transitioning involved the loss of familiar and usual ways of teaching for participants, which was stressful. The transition to online teaching required many resources, including mentors, administrative support, information technology staff, software platform support, policies and procedures, and peer faculty support. Author noted participants expressed fear, disillusionment, and perseverance. Lack of confidence in the new format of online teaching evoked expressions of fear for some faculty: fear of not meeting student needs, not covering essential course content competently, and receiving poor student evaluations. Disillusionment with the lack of or limited administrative support in terms of communication, resources, mentors, orientation, and professional development hindered a smooth transitional experience.	highly focussed on the lived experience of the transition (evidence of attitudes to technology present) several sites and seven HEIs represented (but one geographical area) methodology well discussed member checking of transcript participant voice apparent in results (through verbatim quotes)	8/10

Appendix C. Mixed methods literature summary table

Authors	Title	Aim	Sample	Method	Findings	Critique	Score
Nsouli & Vlachopoulos (2021) Lebanon	Attitudes of nursing faculty members toward technology and e-learning in Lebanon	investigate the attitudes of nursing teaching staff toward the use of ICT in nursing education.	18 participants	Survey and interview (triangulation design)	three main groups of nursing academics pioneers, followers and resisters. Pioneers - self-taught and enthusiastic about technology Followers - wait for institute to prompt their technology use and are nuetrual regarding technology Resisters - against ICT use, concerned ICT might eliminate their role and will only use technology if incentivised Most of the participants technical knowledge is self-taught	Survey tool not tested for reliability or validity Unclear how groups were made Small group Differences in technology compared to Australia (e.g. political instability has led to poor infrastructure such as electrical blackouts and poor internet speeds)	8/10

Jones, Garrity, VanderZwan, Epstein & Burla de la Rocha (2016), USA/Canada	To Blog or Not to Blog: What Do Nursing Faculty Think?	To explore nursing faculty's attitudes regarding blogging as a teaching tool, identifies barriers encountered in integrating blogging strategies in nursing curriculum, and challenges faced by faculty in meeting the needs of millennial learners.	122 participants (nursing faculty)	mixed methods with quantitative and qualitative survey. A convenience sampling method was used, with surveys e-mailed to schools of nursing in Illinois and Ontario. Survey was validated by expert panel. Overall survey Cronbach alpha of 0.941	Faculty believed that students still highly value the face-to-face interaction. Concern online learning was a deterrent to teaching or role modelling the relational aspect of the nursing profession. Respondents indicated concerns about the worth, effectiveness and value of blogging as a pedagogical strategy. Concern in relation to the time commitment as blogging was seen to have a significant learning curve. Participants expressed concern about student access to required digital resources	Singular technology (blogging), only two states targeted for survey, relatively small sample in each state, survey reliability not discussed, clear qualitative data analysis, academic voice clear and supported by evidence (quotes)	8/10

Moule, Ward and Lockyer (2011), UK	Issues with e-learning in nursing and health education in the UK: are new technologies being embraced in the teaching and learning environments?	To scope elearning and teaching implementation in health sciences and practice disciplines throughout the UK and explore those issues influencing implementation and use	Nine HEIs, including 35 staff interviews across the nine sites	mixed methods, survey and semi-structured interview Survey (62 items) included five aspects addressing the implementation of elearning within HEIs: elearning development, elearning environments, learning implementation, portals and future developments.	Participants felt the students were drivers for the development of elearning and use. Participants were seen to have the potential to drive elearning and teaching developments. Those particularly keen on developing and trying new technologies to support learning were viewed as ' technology champions'. Participants expressed a need for local support, technological support was seen as vital Participants reported that poor student IT skills provided a barrier to adoption. Participants expressed concerns about elearning being time consuming A number of participants were reluctant to use elearning, some preferred to leave elearning and teaching development and use to other staff.	adapted validated tool (no data regarding revalidation) no reported reliability testing of survey mixture of lecturers, educational designers and managers in phase 2 (although nursing identifiable) thematic analysis well described	8/10

Appendix D. Permission to use Technology Readiness Index 2.0

RE: TRI 2 survey request form.

Charles Colby <CColby@rockresearch.com>

Tue 11/07/2017 12:35

To: Mark Browning <m.browning@federation.edu.au>

2 attachments (42 KB)

TR Index 2.0 List for Academic Subscribers.docx; image001.gif;

Hi Mark, not sure why I did not respond earlier. I think I got this when traveling and did not get back to it.

The paperwork looks good and you officially have a license to use the TRI 2.0 for your scholarly study. Attached is a list of scale items and recommended instructions for administration. Let me know if you have questions!

Regards,

Charles L. Colby

Principal, Chief Methodologist and Founder

Rockbridge Associates, Inc.

10130-G Colvin Run Road

Great Falls, VA 22066

703-757-5213, x12

Fax: 703-757-5208

From: Mark Browning [m.browning@federation.edu.au]
Sent: Monday, July 10, 2017 10:00 PM
To: Charles Colby
Subject: FW: TRI 2 survey request form.

Hi Charles,

Just following up with the survey request.
Let me know if there is anything else I need to do.
Thanks!

Regards,

Mark Browning

Lecturer | School of Nursing, Midwifery & Healthcare | Faculty of Health

Federation University| Office 2W-245 | Building 2W | Gippsland Campus
Northways Road, Churchill VIC 3842 | PO Box 3191, Gippsland Mail Centre VIC 3841

Telephone +61 3 5122 8383
m.browning@federation.edu.au<mailto:m.browning@federation.edu.au>

[http://www.federation.edu.au<http://www.federation.edu.au/>]www.federation.edu.au<http://www.federation.edu.au/>
CRICOS Provider Number 00103D

[Fed sign]

From: Mark Browning
Sent: Friday, 23 June 2017 2:30 PM

Appendix E. Survey (note formatting of the original survey varied to this copy as this is a PDF of the online survey)

Block 4

Thank you for agreeing to participate in the survey for the study: **Are nursing academics technology ready? Attitudes to technology in nursing education**.
As a nursing academic, you are in an ideal position to provide valuable information from your perspective.

The focus of the survey is your attitude to teaching through eLearning.
The definition of eLearning for this is: "*ELearning refers to educational processes that utilise information and communications technology to mediate synchronous as well as asynchronous learning and teaching activities*" (Jereb & Smitek, 2006, p. 115).

The survey involves 28 questions and is designed to take 10 minutes.
The final question is an option to be part of the interview phase of this study. Please leave your contact details if you would like to be contacted by the research team.
At the end of the survey you will receive a summary screen based on your responses.
Participation in this survey is voluntary and you are free to withdraw at any time or withdraw any unprocessed data previously supplied.
If you have any further questions, please refer to the plain language information statement.

To begin click the next button below

Default Question Block

Page 1 of 3

Please select your age range

24 or less	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65 - 69	70 or more
○	○	○	○	○	○	○	○	○	○	○

What is your gender?

Male ○ Female ○ Other ○

What is your primary nursing/midwifery practice background? (Please select from one of the following)

▼

How many years have you been a registered nurse/midwife (Please select from one of the following)

N/A ○ 0 - 4 ○ 5 - 9 ○ 10 - 14 ○ 15 - 19 ○ 20 - 24 ○ 25 - 29 ○ 30 or more ○

What is your highest completed qualification? (Please select from one of the following)

Bachelor ○ Honours ○ Graduate Certificate ○ Masters ○ PhD ○

What is your current position? (Please select from one of the following)

Associate Lecturer ○ Lecturer ○ Senior Lecturer ○ Associate Professor ○ Professor ○

How many years have you taught at higher education level (University/TAFE)? (Please select from one of the following)

0 - 1 ○ 2 - 3 ○ 4 - 5 ○ 6 - 9 ○ 10 - 14 ○ 15 - 19 ○ 20 - 24 ○ 25 or more ○

At which Higher Education Institution do you primarily teach? (Please select from one of the following)

▼

What types of eLearning have you used in your teaching in the past 12 months, tick all that apply
(examples are in brackets)

☐ Lecture recording ☐ find and upload videos (YouTube) ☐ web-conferencing (virtual classrooms, skype, zoom)

- [ ] lead/guide an online forum
- [ ] PowerPoint
- [ ] content creation in Learning Management System (such as lessons, books, modules)
- [ ] create/edit hypertext
- [ ] create and edit audio/video (Camtasia, iMovie)
- [ ] live polling (Kahoots or Polleverywhere)
- [ ] virtual worlds (Second life, Minecraft)
- [ ] ePortfolios (Mahara, pebblepad)
- [ ] upload files to Learning Management System (Moodle, Blackboard, Web CT)
- [ ] use of plagiarism detection software (Turnitin)
- [ ] collaboration technologies (e.g. Google drive or Microsoft 365)ePortfolios (Mahara, pebblepad)
- [ ] Email
- [ ] Set up quiz for assessment
- [ ] blogging
- [ ] Other (please specify)
- [ ] announcements/notifications through Learning Management System (Moodle, Blackboard, Web CT)

How often, on average, do you engage your students through eLearning during the teaching period? (for example forum posts, virtual classrooms)

Everyday	2 - 3 times a week	once a week	every other week	monhtly	every other month	Other (Please specify)
○	○	○	○	○	○	○

Please select how much you agree with the statement below:

I am confident engaging with teaching through eLearning.

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

Block 1

Please select how much you agree with each statement below

New technologies contribute to a better quality of life

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

○	○	○	○	○	○

Technology gives me more freedom of mobility

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

Technology gives people more control over their daily lives

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

Technology makes me more productive in my personal life

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

Other people come to me for advice on new technologies

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

In general, I am among the first in my circle of friends to acquire new technology when it appears

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

I can usually figure out new high-tech products and services without help from others

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

I keep up with the latest technological developments in my areas of interest

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

Technical support lines are not helpful because they don't explain things in terms I understand

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

Sometimes, I think that technology systems are not designed for use by ordinary people

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

There is no such thing as a manual for a high-tech product or service that's written in plain language

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

People are too dependent on technology to do things for them

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

Too much technology distracts people to a point that is harmful

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

Technology lowers the quality of relationships by reducing personal interaction

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

I do not feel confident doing business with a place that can only be reached online

Unsure	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○	○

Block 2

Please add any further comments in the section below:

Would you be prepared to participate in an interview, either face to face or via phone, on this topic (maximum time one hour)?

Yes	No
○	○

Please leave your contact details below (name, email, phone) and the researchers may contact you for an interview.

Block 3

TRI summary

The following scores are an average from your TRI survey scores.
Minimum score is 1 and the maximum is 5 (general population average is 3).
Note that you can be high across both motivators and inhibitors, as they are not mutally exclusive.

Motivators

Optimism ${gr://SC_9MJVgci91fsYKdn/WeightedMean}

The higher your score on optimism the more likely that you believe that technology and innovation has positive benefits

Innovation ${gr://SC_54pV6U0CZ8PxYi1/WeightedMean}

The higher your score, the more likely your tendency to want to experiment with, learn about and talk about technology

Inhibitors

Discomfort ${gr://SC_6V8Xi8rBMQ3t0mp/WeightedMean}

The higher your score, the more likley you have a perceived lack of control over technology

Insecurity ${gr://SC_80TAI6VxNxFDNJj/WeightedMean}

The higher your score, the moreliekly you beleive that technology can result in adverse impacts on the user and society

Appendix F. Email template to Head of Schools

Mark Browning

Dear INSERT NAME,

I would like to invite the academics at (INSERT INSTITUTE) to participate in my doctoral study: Are nursing academics technology ready? Attitudes to technology in nursing education. As such, I am requesting your assistance to forward my invitation to the nursing staff at (INSERT INSTITUTE) school nursing.

Please find below information regarding this study, and the requirements for participation, below:
The project is designed to identify nursing academic engagement with technology in teaching. As such, participants will be nursing academics from across Australia. Participants will complete a survey and be offered the option to be interviewed. The survey (a validated tool called Technology Readiness Index 2) contains 26 questions and is anticipated to take 10 minutes to complete. The interview will take up to an hour either face to face or by phone and will focus on the academic's experiences of teaching with technology.

Survey results will be used to measure nursing academics' attitudes to technology, while interview data will be thematically analysed to provide further insight into engagement with technology in teaching. By participating, the academics will be making a valuable addition to contemporary knowledge and will lead to greater understanding of the nursing academic and technology in teaching.

Interview and survey data will be de-identified and stored securely on a password protected computer, with only the researchers identified above having access to the de-identified data. The interviews, transcripts and survey data will be destroyed 5 years after completion of the study. The results will be published in peer reviewed journals and conferences, but no identifying data will be used for publication. Further information regarding the project can be obtained by contacting Mark Browning (m.browning@federation.edu.au, 5122 8383).
This research has received ethics approval from the Federation University Human Research Ethics Committee, project number: A18-088.

If you are willing to forward the invitation email and attachments to your staff I would appreciate it very much.
I may also send a reminder email to be forwarded in 2 weeks.

Thank you for your time,
Mark Browning, PhD candidate

Regards,

1

Appendix G. Plain Language Statement

SCHOOL OF NURSING
AND MIDWIFERY
FACULTY of HEALTH

PROJECT TITLE:	**Are nurse academics technology ready? Attitudes to technology in nursing education**
PRINCIPAL RESEARCHER:	**Prof Simon Cooper** (PhD, MEd, BA, RGN, FHEA.). Principal supervisor for Mark Browning.
OTHER/STUDENT RESEARCHERS:	**Mark Browning,** PhD candidate **Prof Lisa McKenna** (PhD, MEdSt, GDLFAH, GDHealthAd&IS, BEdSt , RN, RM, FACN) Secondary supervisor

Survey: https://survey.au1.qualtrics.com/jfe/form/SV_0etVseND17YaQYd

My name is Mark Browning and I am conducting a survey as part of my PhD research on nurse academics' engagement with technology. I would like to invite you to participate in my doctoral study entitled: *Are nurse academics technology ready? Attitudes to technology in nursing education*. Please find information below regarding this study, and requirements for participation.

Background: University student cohorts expect that their learning will make effective and efficient use of technology, that is, high quality elearning (Dahlstrom & Bichsel, 2016). Academics significantly influence elearning by their approach and use of technology, directly impacting students and their ability to be successful eLearners. Regardless of how advanced or innovative technology is, its effective implementation relies upon the academic (Liaw et al., 2007). However there is little research on academic attitude to technology and the impact this has on elearning.

Project: The project is designed to investigate nurse academic engagement with technology in teaching. As such, I am inviting nurse academics from across Australia to participate. The study has two phases, phase one is a survey and phase two is an individual interview. If you choose to participate, you would complete a survey and be given the option to be interviewed. The survey is anticipated to take only 10 minutes to complete and incorporates a validated tool; Technology Readiness Index 2 (TRI 2). Completion of the survey indicates implied consent. The interview will be based around how and why you use technology in your teaching. The interview is anticipated to last up to 1 hour. Survey results will be used to measure nurse academics' attitudes to technology, while interview data will provide insight into attitude to technology in teaching.

Results: At completion of the survey, each participant will be able to see their TRI score and a brief explanation. Interview participants will be asked to verify a summary of the

interview. If you would like to be informed of the aggregate research finding, please contact Mark Browning, m.browning@federation.edu. Be aware that in participating in this research, your de-identified data may be used to inform future research.

Benefits: The TRI and/or interview should give insight into attitude to technology, generate reflection and encourage academics to engage with elearning, benefiting both the academic and the student cohort they teach. All participants who complete the survey within a month of being contacted will be entered into a random draw for a tablet device (approximate value of $350).

Adverse outcomes: This research has been identified as having a negligible level of risk, however if the interview or survey make you feel uncomfortable, you are free to withdraw or contact the research supervisor Prof. Simon Cooper (s.cooper@federation.edu.au, 5122 8023). Support is available from lifeline 13 11 14 or your university counselling service.

Confidentiality: All data will be de-identified, collated and stored securely on a password protected computer, with only the researchers having access to the data. Interview transcripts and survey data will be destroyed 5 years after study completion. Results will be published in peer-reviewed journals and presented at conferences, but no identifying data will be used. Be aware confidentiality of information offered is subject to legal limitations (e.g., subpoena, freedom of information claim, or mandatory reporting).

Consent: Participation is voluntary, refusal to participate requires no explanation, participants are entitled to withdraw their consent to participate and discontinue participation at any time within each phase, prior to data aggregation. If consent is withdrawn after data has been aggregated and processed it will not be possible to withdraw non-identifiable data, although consent can still be withdrawn. You are free to choose not to answer questions on the survey or during interview, without consequence.

Ethical approval: If you wish to make a complaint regarding the conduct of the research you can direct your complaint to the Ethics Officer for attention (see below). This research has received ethics approval from the Federation University Human Research Ethics Committee, approval Project No: A18-088.

Thank you,

Mark Browning, PhD candidate

If you have any questions, or you would like further information regarding the project titled Are nurse academics technology ready? Attitudes to technology in nursing education, please contact the Principal Researcher, Prof. Simon Cooper of the School of Nursing:
EMAIL: s.cooper@federation.edu.au
PH: 5122 8032

Should you (i.e. the participant) have any concerns about the ethical conduct of this research project, please contact the Federation University Ethics Officers, Research Services, Federation University Australia,
P O Box 663 Mt Helen Vic
3353 Telephone: (03) 5327
9765
Email: research.ethics@federation.edu.au

CRICOS Provider Number 00103D

Appendix H. Interview guide

Initial Contact

Interviewer to email participants that supplied their contact information in phase one survey. Email, will contain a plain language statement and interview consent form. Participants to respond via email with attached signed consent form. Interview to take place either face to face or via phone.

Introduction

Thank you for agreeing to be interview for the study: Are nurse academics technology ready? Attitudes to technology in nursing education. My name is Mark Browning and I will be conducting this interview today.

Consent check: I have emailed you the plain language statement and consent form for you to read before this call. Having read the plain language statement and consent form- Do you have any questions?

Background: The topic of the interview today is academic engagement of teaching through elearning. The definition of elearning for this study: "Elearning refers to educational processes that utilise information and communications technology to mediate synchronous as well as asynchronous learning and teaching activities" (Jereb & Smitek, 2006, p. 115). The purpose today is to gain understanding of this topic from an academic's perspective.

Format: The interview is semi-structured, I have some guiding questions but I may also ask you to expand or explore ideas during the interview. The interview is designed to run for one hour at the most, as the interviewer my role is to keep the discussion focussed on the topic. If I see that we are getting off the topic, I will bring us back to the topic so we can finish in a timely manner. Our discussion will be kept secure to the extent permitted by law. We will not use your names in any report. Our interview today is being tape recorded. These recordings allow me to write a more complete report, and to make sure we accurately reflect your opinions. These recordings will be stored for 5 years and then all recordings will be securely destroyed.

Before we begin, do you have any questions?

Interview guide (keep bringing it back to teaching and learning)

Can you briefly describe the courses you currently teach? **(e.g. 2nd year? Clinical?)** *Encourage participant to engage and creates context for the following questions*

How do you engage with technology in your teaching? **(e.g. forums, live polling, YouTube)**

Why do you use this technology?

What is the purpose of technology in your teaching?

Is there technology that you don't use/avoid?

Is there technology that you would like to/plan on using?

What feedback have you had from students in relation to the technology you use?

Do you believe your view of technology influences how/when you use it in teaching? Why? How so?

(PROMPT: *how do you describe your view of technology?*)

Can you describe other factors that influence your use of technology in teaching?

(PROMPT: things that enable you to engage with teaching through elearning? Things that prevent you to engage with elearning?)

SURVEY

Did you agree with your survey summary? (may prompt them with results)

Discuss each factor (optimism, innovativeness, discomfort and insecurity) and their score.

Do you agree? Why?

Anything else you would like to add/discuss?

Conclude:

Thank you for participating in this interview. A summary of the thematic points from this interview will be sent for you to check. My contact details are on the information sheet and email, should you require them.

Appendix I. Email template sent to Participants for interview

Dear PARTICIPANT,

Thank you for agreeing to participate in an interview for my doctoral study entitled: *Are nurse academics technology ready? Attitudes to technology in nursing education* . Please find information below regarding this study, and requirements for participation.
The project is designed to research nurse academic engagement with technology in teaching.
The interview will be based around how and why you use technology in your teaching. The interview is anticipated to last up to 1 hour.

I am available the DATES of MONTH from TIME (Australian Eastern Standard Time). Please let me know any times and dates that suit you (even outside of the above dates) and I will schedule our interview.
Interview data will be thematically analysed to provide further insight into the engagement of technology in teaching, building on the results of the survey data.

All data will be de-identified, collated and stored securely on a password protected computer, with only the researchers having access to the data. Interview transcripts and survey data will be destroyed 5 years after study completion. Results will be published in peer-reviewed journals and presented at conferences, but no identifying data will be used. Further information regarding the project can be obtained by contacting Mark Browning (m.browning@federation.edu.au, 5122 8383).

Participation is voluntary, refusal to participate requires no explanation, participants are entitled to withdraw their consent to participate and discontinue participation at any time within each phase, prior to data aggregation.

If consent is withdrawn after data has been aggregated and processed it will not be possible to withdraw non-identifiable data, although consent can still be withdrawn.
As a participant, you are free to choose not to answer questions during the interview.
This research has been identified as having a negligible level of risk, however if the interview or survey make you feel uncomfortable, you are free to withdraw or contact Mark Browning (m.browning@federation.edu.au, 5122 8383).
There will be an opportunity for you to preview results and transcripts and to withdraw or amend (if appropriate) any data during or at the end of the interview or any unprocessed data previously supplied.

If you wish to make a complaint regarding the conduct of the research you can direct your complaint to the Ethics Officer for attention.
This research has received ethics approval from the Federation University Human Research Ethics Committee, approval number A18-088.

Please find attached a Plain language form and a consent form.
The consent form will need to be filled out and emailed back to be prior to the interview.

Thank you again for your time

Regards,

Mark Browning
Lecturer | School of Nursing, Midwifery & Healthcare | Faculty of Health
Federation University| Office 1116 | Building 903 | Berwick Campus
72 - 100 Clyde Road, Berwick VIC 3806 | PO Box 859, Berwick Vic 3806
Telephone +61 3 5122 8383
m.browning@federation.edu.au
www.federation.edu.au
CRICOS Provider Number 00103D

Appendix J. Email to confirmed interviewees

Dear NAME

Thank you for agreeing to participate in an interview for my doctoral study entitled: *Are nurse academics technology ready? Attitudes to technology in nursing education* . Please find information below regarding this study, and requirements for participation.
The project is designed to research nurse academic engagement with technology in teaching.
The interview will be based around how and why you use technology in your teaching. The interview is anticipated to last up to 1 hour.

Interview data will be thematically analysed to provide further insight into the engagement of technology in teaching, building on the results of the survey data.

All data will be de-identified, collated and stored securely on a password protected computer, with only the researchers having access to the data. Interview transcripts and survey data will be destroyed 5 years after study completion. Results will be published in peer-reviewed journals and presented at conferences, but no identifying data will be used. Further information regarding the project can be obtained by contacting Mark Browning (m.browning@federation.edu.au, 5122 8383).

Participation is voluntary, refusal to participate requires no explanation, participants are entitled to withdraw their consent to participate and discontinue participation at any time within each phase, prior to data aggregation.

If consent is withdrawn after data has been aggregated and processed it will not be possible to withdraw non-identifiable data, although consent can still be withdrawn.
As a participant, you are free to choose not to answer questions during the interview.
This research has been identified as having a negligible level of risk, however if the interview or survey make you feel uncomfortable, you are free to withdraw or contact Mark Browning (m.browning@federation.edu.au, 5122 8383).
There will be an opportunity for you to preview results and transcripts and to withdraw or amend (if appropriate) any data during or at the end of the interview or any unprocessed data previously supplied.

If you wish to make a complaint regarding the conduct of the research you can direct your complaint to the Ethics Officer for attention.
This research has received ethics approval from the Federation University Human Research Ethics Committee, approval number A18-088.

Please find attached a Plain language form and a consent form.
The consent form will need to be filled out and emailed back to be prior to the interview.

Thank you again for your time

Regards,

Mark Browning
Lecturer | School of Nursing, Midwifery & Healthcare | Faculty of Health
Federation University| Office 1116 | Building 903 | Berwick Campus
72 - 100 Clyde Road, Berwick VIC 3806 | PO Box 859, Berwick Vic 3806
Telephone +61 3 5122 8383
m.browning@federation.edu.au
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CRICOS Provider Number 00103D

Appendix K. Consent form for interview

Consent Form

Federation UNIVERSITY • AUSTRALIA

PROJECT TITLE:	Are nursing academics technology ready? Attitudes to technology in nursing education.
RESEARCHERS:	**Mark Browning,** PhD candidate **Prof Simon Cooper** (PhD, MEd, BA, RGN, FHEA.). Principal supervisor for Mark Browning. **Prof Lisa McKenna** (PhD, MEdSt, GDLFAH, GDHealthAd&IS, BEdSt , RN, RM, FACN) Prof. McKenna's role is to provide joint guidance and oversight of the project.

Consent – Please complete the following information:

I _____ of

_____+

hereby consent to participate as a subject in the above research study.

The research program in which I am being asked to participate has been explained fully to me, verbally and in writing, and any matters on which I have sought information have been answered to my satisfaction.

I understand that: all information I provide (including questionnaires) will be treated with the strictest confidence and data will be stored separately from any listing that includes my name and address.

- Aggregated results will be used for research purposes and may be reported in scientific and academic journals.
- I am free to withdraw my consent at any time during the study in which event my participation in the research study will immediately cease and information/data obtained from it will not be used.
- I understand the exception to this is if I withdraw after information has been aggregated - it is unable to be individually identified - so from this point it is not possible to withdraw my information/data, although I may still withdraw my consent to participate.
- I agree to audio recording of the interview

SIGNATURE:_____ **DATE:** _____.

Appendix L. email for member check and example of thematic summary attachment

Dear PARTICIPANT,

I would like to thank you for participating on my PhD research titled: Are nurse academics technology ready? Attitudes to technology in nursing education.

I have transcribed and coded the interview we conducted and have attached a summary of the key excerpts linked to the initial codes for you to review.

If you would like to clarify or discuss any of the material attached please contact meat the email below.
Please email me if you are satisfied with the summary or if no reply if received bythe 20/3/2020 consent for the summary is assumed.

Thank you once again,

Regards,

Mark Browning
Lecturer | School of Nursing and Healthcare Professionals
Federation University| Office 1116 | Building 903 | Berwick Campus 72 - 100 Clyde Road, Berwick VIC 3806 | PO Box 859, Berwick Vic 3806

Telephone +61 3 5122 8383
m.browning@federation.edu.au

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CRICOS Provider Number 00103D

PARTICIPANT member checking

Name	Coded Text
academic aversion to technology	I mean I don't love a forum, I just I think they're static and flat and I don't like them
academic aversion to technology	I think capability seems to be, so you find a lot of the people that are less capable tend to have fairly flat boring sites with, look perfectly fine content but it's like text, just text (yeah). and you might have a recorded lecture with just with just for example at their voice (yep) because it just, that's as much as they can manage
academic aversion to technology	I wonder why people can't work stuff out. (yeah) like it's a just lateral thinking apply any other set of you know non-concrete skills you have and just work it out, you can't break it
academic aversion to technology	new pieces of software to, to try out and I don't think academics got time and many of them don't have skills
academic aversion to technology	Yeah I mean times one but capability but there are people that just don't seem to get computers and I don't understand it (yeah) really and truly they are not tricky.
Having to learn the technology	Yeah I mean times one but capability but there are people that just don't seem to get computers and I don't understand it (yeah) really and truly they are not tricky.
Issues with technology impact on nursing students	I still find the occasional students student that struggles with the with technology generally or the use of a computer and the access to education through that but I think people are generally a great deal more technology savvy
Issues with technology impact on nursing students	what I can do with technology is I can go into a home in Gunada and I can teach a mum of four kids who works part time she's at Gunada hospital and has no way of being able to get education, get a BN in if she doesn't do it online. (yeah) and I love that we get, and we, I mean you you would get about 90 percent women too , and we do also like you get a lot of first in families and I love that what we get to do with technology is change a family's trajectory (yeah). That's what I love. I mean I like technology because I love technology but I love that we are making a difference to families because 25 years ago these women could not have changed their lives by changing from being an EN into an RN and, and because they were home with four kids, their husbands the main breadwinner and they stuck doing what they're doing until all those kids go, and then they say well I'm too old to change now I don't want to upgrade. So I think the thing about it is, is that we have that opportunity and so I do really believe that technology positively influences the capacity for us to teach students
Nursing profession and technology	I think that's probably the thing that I think about that we're here to teach relationships and teach care and the way in which we do it might be through technology but it is secondary to the purpose of care. That's my thought.
Nursing profession and technology	Now we still use res schools for the clinical subjects because learning to give an injection isn't something that you can do easily online.
Nursing profession and technology	nurses go into a room they look first at the at the, the box or the drip don't they (yeah) often and Margarete's work and I quite it would be quite a long time ago she certainly looked at stuff around the use of technology in nursing and how it was important that it was that the relationships were first and foremost and technology remained a tool but not the central focus
Teaching philisophy and technology	I think that's probably the thing that I think about that we're here to teach relationships and teach care and the way in which we do it might be through technology but it is secondary to the purpose of care. That's my thought.
Teaching philisophy and technology	so I apply that into the my teaching because some things are going to work for some students and some things are not, so you've got to do a heap of different things

Name	Coded Text
Teaching philosophy and technology	what we see it's more didactic I suppose you know or you know you get the problem with teaching is you're still telling them aren't you? So the problem I guess we have with if you so we use constructivism as our base our teaching philosophy and the problem is, is that really you can't use that completely didactic model can you? because that actually is anti-constructivism in my mind (very much) so, so you need to use technologies that allow for higher engagement.
Technology for technology's sake	I do think that the problem with relying too much on any sort of, of technology is that people sometimes lose the point of the use of it (yep). That's the only thing
Technology for technology's sake	is that in the end the technology is the tool to access education. If you're spending too much time explaining the technology, it's in the way of the teaching ok?(yeah
Technology for technology's sake	It's where they, they don't see the forest for the trees so they don't use their they're so flummoxed by the technology or the technology becomes omnipresent versus the point of using it
Technology takes Time	new pieces of software to, to try out and I don't think academics got time and many of them don't have skills.
Technology takes Time	Yeah so there's a few things that I've tried when I've had a bit more time so I was only point five up until this year I've gone to point 7 so at Point 5 I could then spend the other two and a half days fiddling around a lot of fun stuff while things like, what did you do today any cleaning? No!
The need for tech to be simple	PebblePad? (yes yes) I think it's an incredibly clunky piece of software nobody, like you, the amount of time you need to support people in learning it overrides the benefit in my mind so I think yeah keep it simple stupid is it's a good thing.
The need for tech to be simple	the things I like are simple for the students use, simple for other academics to use
The University and technology	Except they don't let me get what I like all the time, which is fair enough because universities can't run on a single academics wishes
The University and technology	It is time, so something like Second Life actually needs to be, you need good university, you need grants, you know good university funding for that, and you need someone to set it up and someone else needs to do the actual programming while you just tell them the content so that's the thing I think thing is
The University and technology	The problem is I don't think universities have got the money to be constantly going to get new pieces of software to, to try out and I don't think academics got time and many of them don't have skills. So
Using technology to communicate with students	the discussion forum means that it's enduring information for other students to see. I also use an announcer so we use blackboard as our LMS and so there's an announcement tool that I, as subject coordinator use for the, you know your assignments coming back today please check that
Using technology to engage students	because I love technology I want to introduce it because, I think that, that having you know, that visually engaging technology for students to look at means that they tend to engage more and so I so I tend to use it because of that
Using technology to engage students	I do, I do enjoy doing all that stuff. so I'll often fiddle around with that stuff because I think a visually engaging sides if you can add any of these things into your sitr it makes a difference to the students engagement
Using technology to engage students	I think you got to make it visually interesting to students now, it's a different world.
Using technology to engage students	so you need to use technologies that allow for higher engagement. like things, like voicethread

Appendix M. Final project report for Federation Univeristy Human Research Ethics Committee

Please indicate the type of report	☐ **Annual Report** (Omit 3b & 5b) ☒ **Final Report**
Project No:	**A18-088**
Project Name:	**Are nursing academics technology ready? Attitudes to technology in nursing education.**
Principal Researcher:	**Prof. Simon Cooper**
Other Researchers:	**Mark Browning (PhD candidate). Prof. Lisa McKenna**
Date of Original Approval:	**26/06/2018**
School / Section:	**School of Nursing**
Phone:	**0420370405**
Email:	**m.browning@federation.edu.au**

Please note**: For HDR candidates, this Ethics annual report is a separate requirement, in addition to your HDR Candidature annual report, which is submitted mid-year to research.degrees@federation.edu.au.**

1) Please indicate the current status of the project:				
1a) Yet to start				☐
1b) Continuing				☐
1c) Data collection completed				☒
1d) Abandoned / Withdrawn:				☐
1e) If the approval was subject to certain conditions, have these conditions been met? (If not, please give details in the comments box below)			☐ Yes	☐ No
Comments:				
1f) Data Analysis	☐ Not yet commenced	☐ Proceeding	☒ Complete	☐ None
1g) Have ethical problems been encountered in any of the following areas:				
Study Design			☐ Yes	☒ No
Recruitment of Subjects			☐ Yes	☒ No
Finance			☐ Yes	☒ No

Facilities, Equipment (If yes, please give details in the comments box below)	☐ Yes	☒ No
Comments:		

2a) Have amendments been made to the originally approved project?	
☒ No	☐ **Yes**
2b) If yes, was HREC approval granted for these changes?	
☐ Yes	Provide detail: ☐ **Yes** Application for Amendment to an Existing Project ☐ **Yes** Change of Personnel ☐ **Yes** Extension Request
☐ **No**	If you have made changes, but not had HREC approval, provide detail as to why this has not yet occurred:
2c) Do you need to submit any amendments now?	
☒ No	☐ **Yes** Application for Amendment to an Existing Project ☐ **Yes** Change of Personnel ☐ **Yes** Extension Request * NB: If 'Yes', download & submit the appropriate request to the HREC for approval: Please note: Extensions will not be granted retrospectively. Apply well prior to the project end date, to ensure continuity of HRE approval.

3a) Please indicate where you are storing the data collected during the course of this project: (Australian code for the Responsible conduct of Research Ch 2.2.2, 2.5 – 2.7)
Data collected during the course of this project is being stored on a university provided password protected laptop. In addition, a backup is kept in university endorsed corporate storage OneDrive.
3b) Final Reports: Advise when & how stored data will be destroyed (Australian code for the Responsible conduct of Research Ch 2.1.1)
Data will be destroyed in December 2027 by deletion of all data pertaining to participants (survey and interviews) excluding the final thesis and other publications

4) Have there been any events that might have had an adverse effect on the research participants OR unforeseen events that might affect continued ethical acceptability of the project?	
☒ No	☐ **Yes** * NB: If 'yes', please provide details in the comments box below:

Comments:	

5a) Please provide a short summary of results of the project so far (no attachments please):
The project has resulted in a qualitative and quantitative chapter for a PhD thesis and an integrated chapter utilising both results. The PhD thesis is in the final stages ready for submission
5b) Final Reports: Provide details about how the aims of the project, as stated in the application for approval, were achieved (or not achieved). (Australian code for the Responsible conduct of Research 4.4.1)
The project achieved the aims if the research. The survey has identified the attitudes of academics in relation to technology, including unique insights into technology readiness groups. The semi-structured interviews have explored the reasons for academics' attitudes to technology. The findings revealed three main Technology Readiness groups, representing three attitudes to technology in teaching: Explorers, Sceptics and Hesitators. Explorers were found to be innovative, positive and confident in their use of technology; Sceptics showed aversion to technology, were cautious when considering the impact on pedagogy and concerned about the impact on interpersonal skills; Hesitators showed preference for traditional teaching and distrust and were anxious about technology use. Overall, attitudes were found to be complex, based on experience and the potential impact technology may have on nursing students. The thesis has been able to provide recommendations and implications as a result of this research.

6) Publications: Provide details of research dissemination outcomes for the previous year resulting from this project: eg: Community seminars; Conference attendance; Government reports and/or research publications
This project was presented at the 2022 Federation University HDR conference. A PhD thesis is to be submitted by the 15th of December

7) The HREC welcomes any feedback on: • Difficulties experienced with carrying out the research project; or • Appropriate suggestions which might lead to improvements in ethical clearance and monitoring of research.

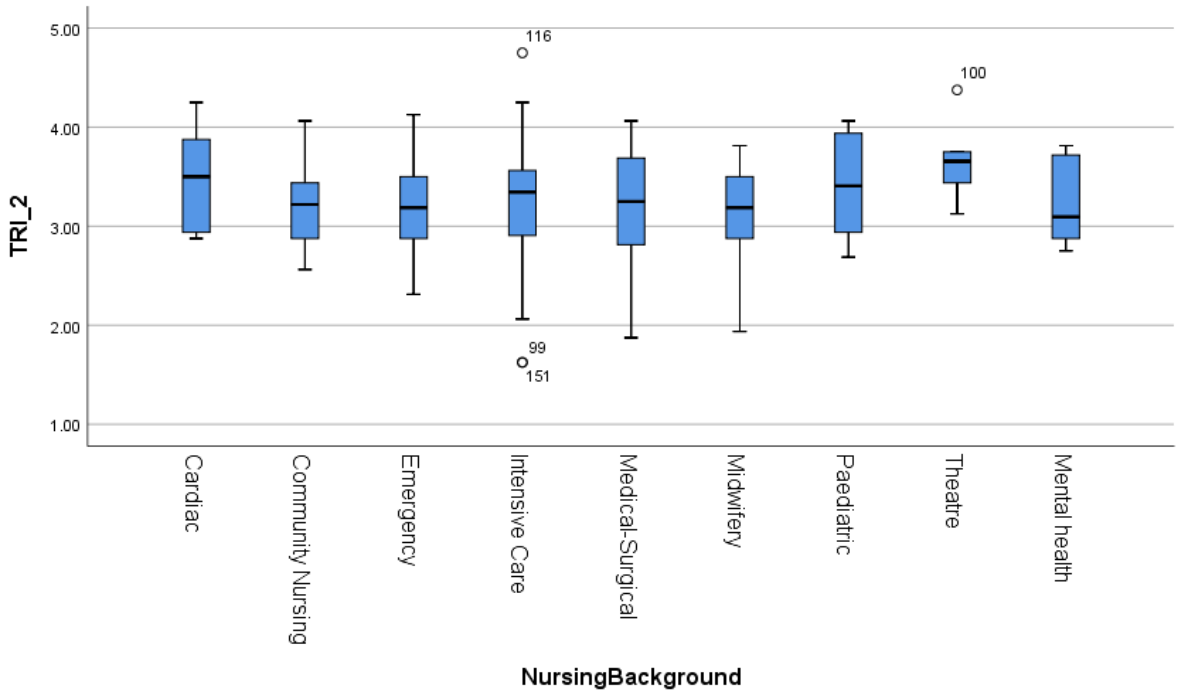
8) Signatures			
Principal	S I R Cooper	Date:	**15/12/2022**

Researcher:	**Print name: Prof. Simon Cooper**		
Other/Student Researchers:	MGBrowning **Print name: Mark Browning**	Date:	**15/12/2022**
	…….. **Print name:**	Date:	

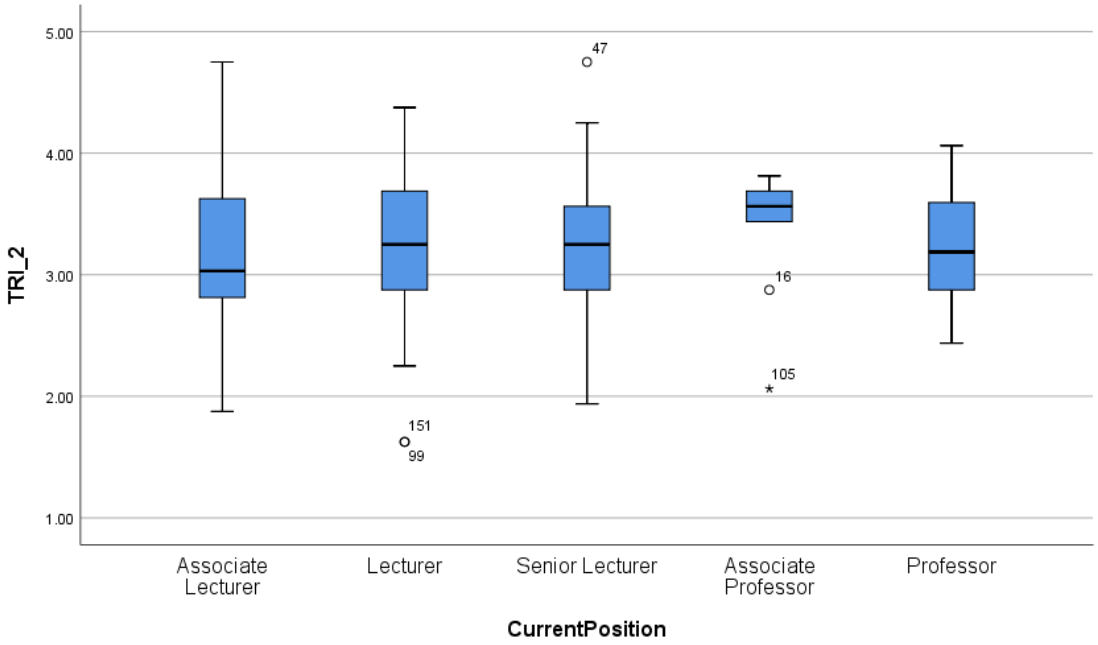
Submit to the Ethics Office, Mt Helen campus, by the due date:
research.ethics@federation.edu.au

Appendix M. Box plots of visual inspection for means and distribution from Quantitative analysis

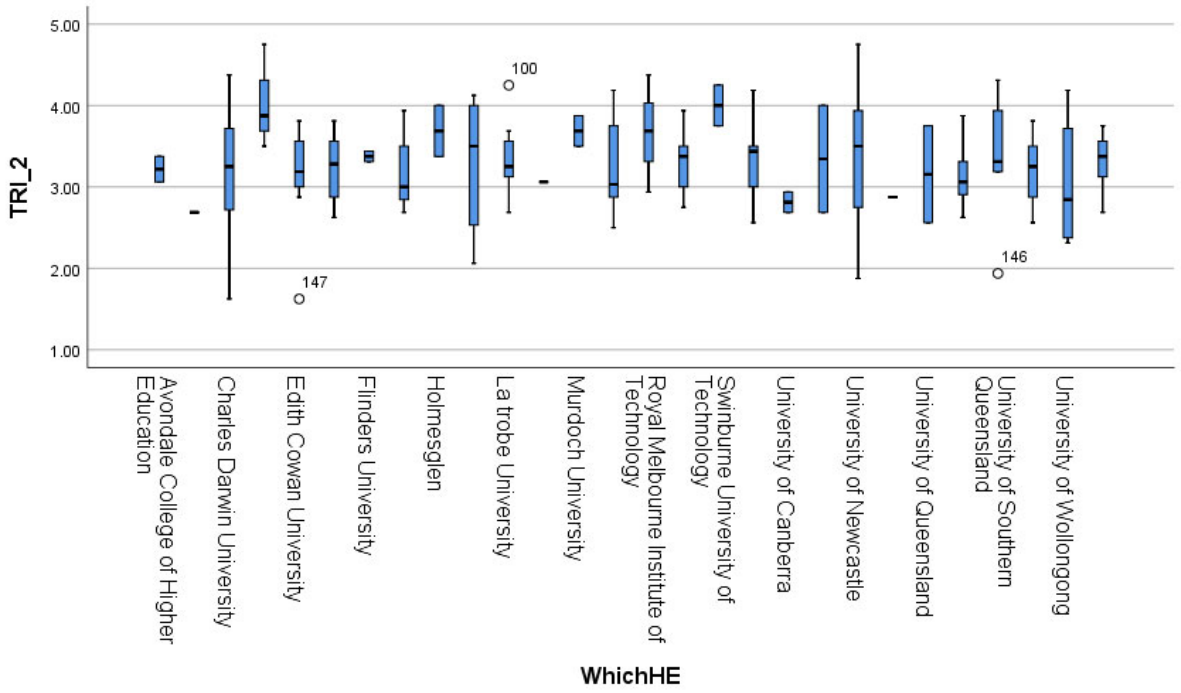
Nursing background and TRI score



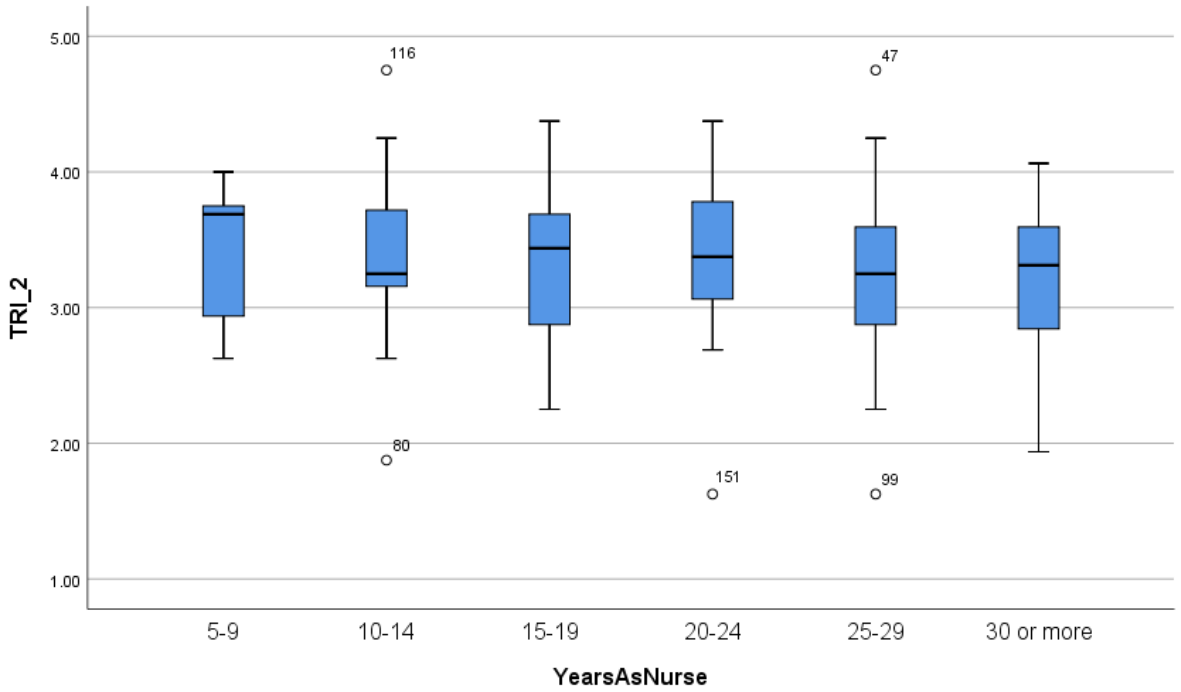
Current employment position and TRI score



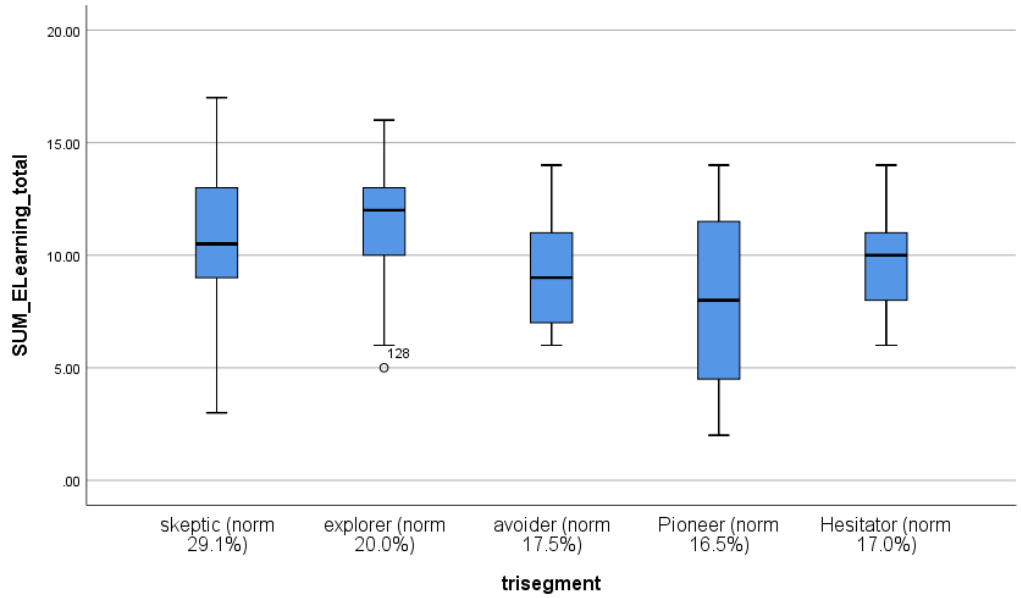
Institute of employment and TRI score



Years as RN and TRI score



Number of elearning technologies and TRI Group



Self-rated confidence and TRI Group