An Exploration of Student and Academic Issues Relating to E-learning and its Use in Undergraduate Nursing Education in Australia: A Mixed Methods Inquiry

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Declaration

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Elizabeth Button

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Abstract

Introduction

Since the 1980’s the use of computers, internet and social media has increasingly played a role in the field of education. Learning via electronic technology (E-learning) has offered many benefits, but also has presented a number of challenges. These challenges may also be impacted by the increasing role that Information Computer Technology (ICT) plays in the health professions. Students studying in these professions, such as in nursing, not only need to be able to use ICT at University but also in their practice. Failure to attain proficiency in Computer Information Literacy (CIL) skills at university therefore, can impact on the ability of students to care for their clients. This study aimed to examine the current issues around E-learning, and the associated ICT from the perspective of nursing students and academics in nursing education in Australian undergraduate programs.

Methods

The thesis used a two phase sequential qualitative then quantitative mixed methods approach guided by the philosophical underpinning of pragmatism according to John Dewey. The focus of the study was to investigate issues encountered by Australian undergraduate nursing students and academics when using E-learning and associated technologies. The value of mixed methods research is enhanced through the integration of both qualitative and quantitative data. Integration was achieved when different data elements and strategies for analysis were combined so that the resulting research findings were greater than the sum of the parts

Phase 1, the qualitative arm of the study, used separate focus groups of students and academics. The focus groups identified issues unique and some common to nursing students and academics. The Phase 1 findings were used to develop two online questionnaires that comprised the second phase of the study. The Phase 2 online questionnaires were distributed Australia-wide to Schools of Nursing and Midwifery. The resulting quantitative data from the two questionnaires; were analysed using Factor analysis and nonparametric tests. Content analysis was performed on the questionnaire’s open response items.

Results

A total of 27 students and 25 academics from one University participated in the Phase 1 focus groups, and 466 students and 203 academics from 13 and 18 Universities, respectively, responded to the online questionnaires. The results from both Phases of the study were then integrated by quantitating the qualitative data and qualitising the quantitative data.

The integrated student findings revealed that while undergraduate nursing students frequently used the internet and social media for personal communication, they perceived difficulties in using E-learning, and that they required assistance in developing CIL skills when undertaking their university studies. Academics, on-the-other-hand, were more positive and confident about using E-learning in their curriculum as long as issues relating to the lack of leadership in the area of E-learning, professional development, and the time taken to develop, implement and evaluate E-learning resources are acknowledged.

Conclusion

Considering that the use of technology will continue to increase within the health sector, and that the knowledge required to practice effectively should be evidence-based, it is important that undergraduate nursing students are develop the CIL skills required to use new ICT technologies and be able to locate recent, internationally reviewed research articles. Therefore, it is imperative that academics are provided with relevant and timely support to maximise their CIL skills. Further, educational versions of digital communication systems used in health care agencies should be made available to the tertiary education sector to allow students to build CIL skills.

Definition of Terms

Activity/activities – The way a topic will be taught, e.g. lectures, practicals, tutorials, seminars.

Bachelor of Nursing (Pre-Registration) – A program of study for students with no previous formal nursing qualifications who would like to become eligible to register with the Nursing and Midwifery Board of Australia as a Registered Nurse. Students in this course are required to do professional experience placement (work experience) during their program of study.

Course – A program of study leading to a degree.

Graduate entry – A Bachelor of Nursing pathway for candidates who are graduates of a degree in academic areas other than nursing,

Topic – A subject that forms part of a course. A full time first year student will normally enrol in four topics in each semester, depending on their course requirements.

List of Acronyms

ABS	Australian Bureau of Statistics
AU	Actual Use
AEHR	Academic Electronic Health Record
AFTN	Assessing Faculty Technology Needs
AHPRA	Australian Health Practitioner Regulation Agency
AIWBES	Adaptive and Intelligent Web-based Educational Systems
ANMAC	Australian Nursing and Midwifery Accreditation Council
APEL	Academic Perception of E-Learning
AQF	Australian Qualification Framework
AR	Augmented Reality
ATCUS	Attitudes toward Computer Usage Scale
ATO	Australian Taxation Office
ATU	Attitude to Using
AWPD	Attitudes toward Web-based Professional Development
BYOD	Bring Your Own Device
CD	Compact Disc
CIL	Computer Information Literacy
DSS	Database Searching Skill
DVD	Digital Versatile Disc
ECAR	Educause Centre for Analysis and Research
ECG	Electro Cardio Graph
EHR	Electronic Health Record
ELS	E-Learner satisfaction
EPAS	Enterprise Patient Administration System
ESL	English Second Language
FGA	Focus Group Academic
FGS	Focus Group Student

FNC	Federal Networking Council
ICT	Information Computer Technology
I-CVI	Item-content validity index
IoT	Internet of Things
IRSD	Index of Relative Socio-economic Disadvantage
IT	Information Technology
ITASH	Information Technology Attitude Scales for Health
KMO	Kaiser-Meyer-Olkin
LMS	Learning Management System
MAR	Missing at Random
MCAR	Missing Completely at Random
MP3	Moving Picture Experts Group Phase 3
NBN	National Broadband Network
NEDI	Nursing Education Drop In
NHMRC	National Health and Medical Research Council
NI	Nursing Informatics
NMBA	Nursing and Midwifery Board of Australia
NMC	New Media Consortium
OFSS	Online Faculty Satisfaction Survey
PCA	Principal Component Analysis
PCEHR	Personally Controlled Electronic Health Record
PEOU	Perceived Ease of Use
PD	Professional Development
PDF	Portable Document Format
PIL	Project Information Literacy
PU	Perceived Usefulness
QSEN	Quality and Safety Education for Nurses
reflsqrt	reflected square root transformation
S-CVI	Scale-Content Validation Index

SD	Standard Deviation
SimMan	High fidelity mannequin
SPEL	Student Perception of E-learning
SPSS	Statistical Package for Social Science
TAM	Technology Adoption Model
TBITC	Teacher’s Beliefs and IT Use in the Classroom
TC	Topic Coordinator
TEQSA	Tertiary Education Quality Standards Agency
UEEUT	Use of E-learning Environments by University Teachers
US	United States
UVicIED-HER	University of Victoria (Canada) Interdisciplinary Electronic Health Record Educational
VET	Vocational Education and Training
VIF	Variance Inflation Factor
VR	Virtual Reality
WHO	World Health Organisation

Publications, Awards and Presentations

Publications

2014 **Button, D**, Harrington, A, Belan I, *E-learning in Undergraduate programs issues for students and educators: A review of the literature. Nurse Education Today, 34(10), 1311-1323. doi: 10.1016/j.nedt.2013.05.002.*

This publication has achieved 3,144 reads and has 53 citations as of 26 July 2017 (Research Gate).

At July 2017, Paper under review with Garnett, T and **Button, D.** submitted to Nursing Education in Practice titled: *Who is motivated to learn with digital badges? A pre-registration nursing bioscience classroom case study for the use of digital badges in higher education.*

Awards

November 2016 Awarded as part of team **Button, D.** $10,000 Faculty Teaching and Learning grant titled: *Cultural Empathy - using 3D video to enhance nursing/midwifery undergraduate culturally competent care.*

Winner in 2013 Flinders University School of Nursing and Midwifery 3 Minute Thesis competition **Button, D.**; *E-Nursing in the 21st century.*

Conferences papers and posters

May 2017 – 7th International Clinical Skills conference in Prato Italy paper titled **Button, D.**: *Using MP4 Files to Assess First Year Nursing Students' Skills in Health History Assessment.*

December 2016 – 33rd Australasian Society for Computers in Learning in Tertiary Education ASCILITE Adelaide South Australia Conference Garnett, T. and **Button, D.** paper titled: *A case study exploring video access by students: wrangling and visualising data for measuring digital behaviour.*

April 2016 – 6th International Nursing Education Today Conference Brisbane Queensland **Button, D.** paper titled*: BYOD in Year 1 Bioscience: Building Computer Information Literacy skills in the Flipped Classroom.*

September 2015 – Higher Education Research Group Adelaide (HERGA) South Australia conference Garnett, T. and **Button, D.** paper titled: *Badges! Badges? Badges...Lessons learned playing with digital badges.*

December 2014 – 31st Australasian Society for Computers in Learning in Tertiary Education (Australia) ASCILITE conference Dunedin New Zealand. Garnett, T. and **Button, D.** paper titled: *Flipping learning with online gamification: Adopting game elements in Moodle for motivating first-year nursing students to be prepared.*

June 2014 – 5th International Nurse Education Conference Noordwijkerhout, The Netherlands. Conference **Button, D.** paper titled: *Students please turn your smart phones on. Using a cloud based student response system to track learning.*

April 2014 – 16th National Nurse Education Conference in Adelaide South Australia **Button, D.** paper titled: *E-learning in Undergraduate programs issues for students and educators: A review of the literature.*

April 2014 – National Nurse Education Conference in Adelaide South Australia Plenary session **Button, D.** paper titled: *What is on the Horizon for Nursing education? Are we ready for the possibilities?*

April 2014 – National Nurse Education Conference in Adelaide South Australia **Button, D.** Award winning poster titled: *Quick response (QR) codes in nursing laboratories.*

April 2014 – National Nurse Education Conference in Adelaide South Australia **Button, D.** poster titled: *Students please turn your mobile phones on; using cloud based student response system to track learning*.

Chapter 1 Introduction

1.1 Introduction

It is undeniable that the internet has changed human lives. Tasks that previously required travel can now be accomplished with a few mouse clicks on an internet-connected device. This includes education related tasks because education at all levels from preschool to higher education has been impacted by the ubiquitous nature of information computer technology (ICT). However, the rush to incorporate the latest ICT into nursing education may have overlooked a number of aspects unique to the education of nurses that need to be considered; aspects that may not be suited to ICT or cannot be learnt via this medium (Reid 2014).

Nursing as a profession has been acknowledged as a mix of art and science where the nurse provides a therapeutic blend of human caring and implementing precise evidence-based care of the whole person (Peplau 1988, Smith 1997, Jasmine 2009). Nursing is also perceived as involving a high human touch component (Routasalo 1999), meaning the nurse’s body is physically in contact with the patient’s body while providing care. Research has shown that the mere presence of the nurse in the patient’s room can decrease the patient’s level of anxiety and as a result, their level of pain (Finfgeld-Connett 2006, Anderson, Friesen *et al.* 2016).

Why, then, is it seen as appropriate to carry out the educational preparation of nurses using ICT in place of face-to-face classroom or nursing laboratory work? Are nurse academics being pushed to incorporate the use of ICT because it provides better learning for students? Or does the reason become an economic rationalist argument where the projected workforce needs for the health care industry and university budget lines dictate how many nursing students will be enrolled each year?

In Australia, workforce planning shows a 17% increase from 2009 to 2012 in commencing student enrolments in programs of study required for initial registration as a RN (Health Workforce Australia 2014). This data indicates that university programs have increased their intake numbers, putting facilities and nurse academics under greater pressure to manage increasing cohort sizes. It is not unusual for undergraduate cohort sizes to be over 500 in each year of the program, despite new nurse graduates struggling to find employment. However, the latest World Health Organisation report (Global Health Workforce Alliance 2013) estimates a global deficit of approximately 12.9 million skilled health professionals (midwives, nurses and physicians) by 2035, implying the need for greater numbers of students in nursing programs worldwide. Is electronic learning (E-learning) and its associated ICT the answer to educating these students?

This thesis investigates the concern that institutions are not providing students and academics with the equipment or time to learn the skills required to maximise the potential E-learning is purported to afford. While it does not suggest rejecting the incorporation of ICT into nursing education – it acknowledges that some ICT currently used in nursing education provides very powerful learning for nursing students (Cant & Cooper 2010, Burbach, Barnason *et al.* 2015, Najjar, Lyman *et al.* 2015) – it uses a mixed methods research design to provide qualitative and quantitative perspectives to illuminate contemporary and persisting issues related to E-learning and associated ICT in undergraduate nursing programs in Australia.

In this thesis, E-learning refers to any learning undertaken on a computer device, whether connected to the internet or not. Universities have invested significant resources in the implementation of learning management systems (LMS) computer software, which tracks and administers the delivery of E-learning. Its implementation is aimed at reducing costs in management of educational programs, decreasing physical teaching space, enticing new students, enhancing knowledge development, increasing content continuity and sequencing, and increasing facilities to audit achievement of standards in course design, delivery and student performance (King 2001, Dutton & Loader 2002, Katz 2003, Brown, Williams *et al.* 2011). While LMS may be cost effective, the implementation of E-learning has uncovered many challenges for institutions, academics and students.

In addition to providing learning activities that promote the development of a caring holistic nursing health professional, nurse academics are charged with the responsibility of preparing nursing students today for tomorrow's health workforce. Critical to developing a safe health workforce and implementing best evidence-based practice in the dynamic, rapidly changing health care environment is health professionals' ability to locate, critically evaluate, secure and use information provided in multiple formats, increasingly electronically. Thus, nurse academics need to facilitate students' learning to enable them to acquire this ability. They also need to provide future registered nurses with the knowledge, skills, attitudes and experiences to promote lifelong learning. Integral to the promotion of lifelong learning is the design, implementation and evaluation of a smorgasbord of educational strategies, including diverse, interactive technological tools and information.

One example of very useful ICT implementation is high fidelity simulation. Here, the nurse academic uses a computer manipulated life size mannequin, also known as SimMan®, to teach and assess nursing students' clinical skills, reasoning skills, communication and teamwork. The high fidelity mannequin appears to students to behave like a human person. Students' performances are videotaped for the purposes of feedback immediately following a simulation scenario (Arthur, Kable *et al.* 2011, Dunnington 2014, Najjar, Lyman *et al.* 2015).

The mannequin can converse with the students, has body sounds such as heart beat and breathing, and responds to nursing interventions such as medication administered by the student. Using SimMan®, students learn experientially through scenarios developed by nurse academics, where students' actions or inactions do not put actual patients at risk.

The power of the learning occurs during the face-to-face debriefing session held immediately after the simulation scenario. Students can watch their performance as a nurse academic guides them through the video. Students learn from observing their own actions of effective, ineffective and omitted individual and team-based care (Cant & Cooper 2010, Burbach, Barnason *et al.* 2015, Najjar, Lyman *et al.* 2015).

1.2 Chapter outline

This chapter presents a brief summary of some of the history of ICT developed for education, followed by an overview of the latest worldwide trends in ICT innovations (including E-learning), and their applications to nursing and clinical practice. It then summarises worldwide concerns related to ICT literacy and how this impacts academics and student learning. The subsequent part of the chapter describes the current mix of nursing students living in the connected world and entering university studies, and how their ICT skills enhance or hinder their learning in the online environment; outlines how ICT and E-learning is being used in nursing education; and raises some of the concerns expressed by nurse academics worldwide regarding the implementation of ICT and E-learning.

The next section outlines the foundations of constructive learning theory and introduces the reader to the "E-learning ladder" developed by Moule (2007). The similarities between the "e-learning ladder" and John Dewey's educational philosophy of how learning occurs are also discussed. The researcher then relates a number of experiences and changes occurring in Australian health care that provided the impetus for the study reported in this thesis. The final part of the chapter describes the research aim and objectives, and outlines the thesis chapters.

1.3 History of the development of ICT in education and health

Students and academics in universities today use computers and access the internet and intranet as an integral part of their everyday study and work experiences. This section explores the early development of computers in education, including identification of students' and academics' perceptions of issues.

1.3.1 Early development of ICT for education

The first use of computers for learning occurred in the 1960s, followed by the invention of email and computer conferencing over packet-switched networks in 1971 (Harasim 2006). The 1980s and 1990s saw a period of intense innovation and rapid advancement, with E-learning being networked through public schools, universities and professional workplaces. In 1975, nursing education used Computer Assisted Instruction (CAI) (Valish 1975) and in 1982 nurse academics developed computer simulations to evaluate nursing students' assessment skills (Swreney, O'Malley *et al.* 1982). A taxonomy of games and simulations for nursing education was developed in the late 1980s (Duke 1986). However, many students did not have access to computers in the home environment and were unable to fully utilise these nursing education technological innovations.

1.3.2 Quality issues in early nursing E-learning

The results of research during the late 1900s and early 2000s indicated that E-learning resources were not up to expected standards (D'Alfonso & Halvorson 2002). Costs of hard-ware, soft-ware and learning resources set-up and maintenance (Grigg & Stephens 1998, D'Alfonso & Halvorson 2002), and purchase of software licenses (Grigg & Stephens 1998, McAuley 1998, D'Alfonso & Halvorson 2002) were exorbitant. Software was poor quality, unsophisticated and often inadequate for the learning task (Grigg & Stephens 1998, Henderson 1998, D'Alfonso & Halvorson 2002). Educational ICT design technologists sought a way to coherently communicate rapid, ever-changing advances to all those involved in delivering E-learning incorporating ICT. Their efforts resulted in publication of the annual Horizon report (Johnson, Adams Becker *et al.* 2014), which provides higher education ICT decision makers worldwide with the information and predicted trends in educational ICT they need to keep up to date. The report is discussed in the next section.

1.4 Worldwide trends in educational media technologies

Annually, since 2002, the Horizon report (Johnson, Adams Becker *et al.* 2014) has been compiled by worldwide leaders in educational ICT known as the "New Media Consortium" (NMC) (Johnson, Adams Becker *et al.* 2015) to share the latest trends and challenges in educational ICT. The report's objective is to provide academics with expert research and analysis to assist them to build upon the innovations happening at their institutions.

In 2016, the Horizon report expert panel highlighted the following six technologies as having the potential to enable real changes in education, principally in the development of advancing pedagogies and learning strategies, the organisation of academics work, and the arrangement and delivery of content:

1. Bring your own device (BYOD)
2. Flipped classrooms
3. Makerspaces
4. Wearable technology
5. Adaptive learning technologies

6. The Internet of Things (IoT).

The next six sub-sections give a brief overview of these six technologies in light of their expected high impact on nursing education, and discusses the estimated time to their adoption by educational institutions and students.

1.4.1 Bring your own device (BYOD)

It is estimated that within the next year or less employees and students worldwide will bring their own internet-connected computer technology with them for work and study purposes (e.g. Smart phones, IPads, tablets and laptop computers). The inclusion of mobile devices has the potential to enhance student engagement, prepare students for their career, improve communication and personalise education. However, there is a risk for student inequity if universities do not consider students who do not have access to mobile devices. The implications for higher education institutions are the need to continually update information technology (IT) infrastructure to accommodate BYOD policies (Shah 2013, Gidda 2014), and to ensure that issues related to policy, security, safety, training and an exponential increase in data storage requirements are addressed (Palmer Research 2013)

1.4.2 Flipped classrooms

Universities have widely adopted the “flipped” classroom; a model of learning that rearranges how face-to-face learning opportunities are utilised (Fraga & Harmon 2014, McLaughlin, Roth *et al.* 2014, Abeysekera & Dawson 2015, Bernard 2015, O'Flaherty & Phillips 2015, Owen & Dunham 2015). Students access online learning resources prior to, and following face-to-face classes. This enables learner-centred face-to-face interactions, with students engaging in an inquiry-based learning environment. Facilitated by the academic, students collaborate in small and large groups, and use higher order thinking skills in the development, consolidation and construction of knowledge. Thus, in the classroom, academics do not “deliver” content but take the opportunity to interact with, coach, observe, assist in the identification of learning needs and ultimately guide students to a higher level of learning (November & Mull 2012, Fraga & Harmon 2014, McLaughlin, Roth *et al.* 2014, Abeysekera & Dawson 2015). This face-to-face, discursive approach is not simple. It requires academics with well-developed knowledge to facilitate exploration of students’ questions and hypotheses (November & Mull 2012).

The relevance for higher education is the opportunity to provide online resources that will increase the value of usable face-to-face time, for example in the face-to-face class setting. A continuing issue with flipped classrooms is the reliance on videoed lectures and pre-readings as the building blocks for interactive classroom sessions (November & Mull 2012). Academics’ role in the development of online resources is essential in the flipped classroom. Such resources should be very carefully constructed so that students interact and engage with materials, and ultimately with one another via online discussion forums, face-to-face sessions or study groups. These online resources should provide rich experiential opportunities, such as quizzes with immediate discursive feedback, requiring students to think deeply and identify questions about what they are learning. Using the internet-connected space also provides an opportunity for students to learn collaboratively.

1.4.3 Makerspaces

"Makerspaces", "hackerspace", "creative space", "fab lab" or "makelab" are community workspaces where users have access to tools, equipment and policies to assist them in the development of physical prototypes, objects and ideas (Doughtery 2013, Weinmann 2015). The potential benefits of Makerspaces in university settings are:

- increased student motivation
- enhanced learning through deeper level involvement in learning activities
- increased opportunities for interdisciplinary teamwork
- increased group and interdisciplinary communication
- development of an entrepreneurial spirit
- practical applications
- encouragement of hands-on learning
- preparation for future career
- empowers development, building and testing of new ideas/prototypes
- increased problem solving ability through students' involvement in processes from identification of a problem to collaboratively developing a tangible solution (von Hippel 2005, Berglund & Leifer 2013, Johnson, Adams Becker *et al.* 2013, Weinmann 2015).

Doughtery's (2013) description of "Makers" (people who use technology in a Makerspace) clearly indicates that makerspaces may be an extremely positive learning experience for interdisciplinary collaborative education in health care in relation to the equipment and processes used in the provision and support of patient care:

> Makers [people using technology in a Makerspace] give it a try; they take things apart; and they try to do things that even the manufacturer did not think of doing. Whether it is figuring out what you can do with a 3D-printer or an autonomous drone aircraft, makers are exploring what these things can do and they are learning as well. Out of that process emerge new ideas, which may lead to real-world applications or new business ventures. Making is a source of innovation. (Doughtery 2013 p.1)

Some examples of the use of Makerspaces in nursing and health care include the nursing students at the University of Texas Medical Branch's John Sealy Hospital in Galveston Texas who created glow-in-the-dark medication bottles, catheter protectors, a shower system for the burns unit, laser-cut bandages for babies under 28 days old and a water-proof shield so patients could shower without taking out IV lines (Young 2015). Another example is that of the “Hacking Medicine” hackathon, where a 150 Massachusetts Institute of Technology (MIT) engineers and MIT Sloan business students worked with clinicians and health care administrators to design and prototype creative, innovative companies that provide health care solutions such as the “PillPack”, which fills, sorts and delivers individual patients’ medications, thereby decreasing medication errors. A third example is the “Podimetrics”, an insole worn by a person who has diabetes, which collects and transmits data to assist in the early detection of diabetic complications in the person’s feet (MIT Sloan Management 2013). These innovations demonstrate the exciting opportunities nursing education may embrace in the future.

1.4.4 Wearable technology

Implementation of wearable technology is still in its infancy and is expected to take at least 3-5 more years to become practical (Patel, Park *et al.* 2012, Foote 2015, Johnson, Adams Becker *et al.* 2015). At present, wearable education technology is expensive, cumbersome, and lacks pragmatic utility and fluidity. Such devices include:

- Oculus Rift® (a virtual reality device) (VR) to augment reality (AR) like Microsoft’s HoloLens®. AR overlays digital graphics on top of what the person is viewing. These devices allow students to engage in experiential learning by being transported to virtual 3D worlds
- Apple Watch® and Samsung Gear®, which can build an academic-student relationship, thus assisting students with a lesson or question via FaceTime®
- Life-logging devices such as Autographer®, Narrative Clip® or Google® glasses – tiny cameras that capture snapshots of the day
- Brain-sensing headband Muse®, which can inform academics of how the student group reacts to selected learning activities. Muse® can also spot patterns that equate to distracted thoughts and use audio prompts to get students to refocus
- Smart jewellery designed to detect specific fumes and alert students and laboratory staff to evacuate
- Smart bracelets that measure heart rate, breathing rate, hydration levels and steps. (Johnson, Adams Becker *et al.* 2013, Foote 2015)

1.4.5 Adaptive learning technologies

The next innovation, which has an expected adoption time of 4-5 years, is adaptive learning technologies software. The aims of adaptive learning technology are twofold: 1) to assist academics to adapt lessons based on an automatic computerised appraisal of students’ progress; 2) to provide information that enables academics to automatically track each student’s progress (Chacon, Spicer *et al.* 2012). Adaptive and Intelligent Web-Based Educational

Systems (AIWBES) commenced development in 1995. The goal of these computer technologies is to personalise learning by assisting students to achieve their learning outcomes. The technologies build a model of each individual student's goals, preferences and knowledge, and use this model throughout the interaction with the student to adapt to that student's needs (Johnson, Adams Becker *et al.* 2013, Foote 2015).

The development of adaptive learning software reflects the movement toward personalising the learning experience for each student. Students complete online learning activities, including quizzes, and the software is programmed to analyse the students' learning style and select and present the student with additional learning activities that suit them (Syansbury 2014). The positive attributes of adaptive learning include:

- Real-time online response to students' work and progress
- Provides academics with data to analyse, interpret and respond to individual students' and groups of students' progress and development
- Decreases the risk of students falling behind in their studies and therefore increases retention because of the additional personalised learning experiences and academics' response to computer alerts that a student is experiencing problems in completing the required work
- Increases productivity of learning interactions between academics and students (Education Growth Advisors 2013).

Some of the perceived issues with adaptive technology include:

- Conflict with the prevailing teaching paradigm at a given institution
- Modest student outcomes due to poorly prepared and executed implementation
- Complexity in construction of adaptive learning activities may deter sceptical faculty from further exploring such technology
- Limited utility in entry-level and remedial courses may pose a significant challenge to scalability (Atkinson 2015).

1.4.6 The Internet of Things (IOT).

The final innovation identified by the 2015 Horizon report was the "Internet of Things" (IOT). Here, software applications have been developed to provide the ability to connect any device with an on/off switch to not only the internet but also to each other. This includes, but is not limited to, mobile phones, machines, headphones, lamps and wearable devices. IOT has the potential to increase people-people, people-things and things-things relationships (Kortuem, Bandara *et al.* 2013). The future possibilities of ICT for students and academics appear to be without limits. However, for students and academics to access the full potential of ICT and E-learning, they need computer information literacy skills (CIL).

1.5 Computer information literacy (CIL)

Computer information literacy (CIL) comprises both computer and information literacy skills. This thesis uses the definition of CIL developed by the Association of College and Research Libraries in 2015 states:

> [Computer] Information literacy is a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. (Association of College and Research Libraries 2015)

1.5.1 The need for improved computer information literacy (CIL)

The 2017 Horizon report also indicated that low CIL is one of the key challenges worldwide currently obstructing the success of E-learning (Adams Becker, Cummins *et al.* 2017). In every discipline and profession, the importance of CIL as a skill continues to rise (Johnson, Smith *et al.* 2010). Johnson and Levine *et al.* (2010) point out that there is a mismatch between the need for CIL and it being taught and developed. While many universities are using professional development to upskill staff in CIL, this is far from the norm worldwide (Johnson, Smith *et al.* 2010). The situation wherein student and academic development may be constrained is exacerbated by the fact that ICT is evolving so quickly that CIL is always catching up.

In 2010, the American Library Association developed standards to assist in determining what skills are required for a person to be seen as computer literate. A person must achieve the five standards below to be evaluated as competent in information literacy whether accessing print or digital technology (see Appendix 1 for full Information Literacy standards for higher education)

Standard 1. The information literate student determines the nature and extent of the information needed.

Standard 2. The information literate student accesses needed information effectively and efficiently.

Standard 3. The information literate student evaluates information and its sources critically, and incorporates selected information into his or her knowledge base and value system.

Standard 4. The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.

Standard 5. The information literate student understands many of the economic, legal, and social issues surrounding the use of information, and accesses and uses information ethically and legally. (American Library Association 2010)

Nurse Informatics (NI) is a specific form of CIL required by nursing and midwifery students, and nursing graduates.

1.5.2 Nursing Informatics in nursing education

Nursing Informatics (NI) is a product of the scientific synthesis of information in nursing. It encompasses concepts from Computer Science, Cognitive Science, Information Science and Nursing Science (McGonigle & Mastrian 2015). It continues to evolve as more and more professionals access, use and develop the information, computer and cognitive sciences necessary to advance Nursing Science. Students' application of knowledge and skills achieved from this learning possesses the potential to provide high quality care and advancement of the profession (Canadian Association of Schools of Nursing Association Canadienne des écoles de Sciences Infirmières 2013).

1.5.3 Learning Management Systems (LMS) to support E-learning

The amalgamation of LMS into everyday teaching has required considerable reorganisation of customary routines, processes and procedures by academics in both teaching and administration. Academics are the content experts and assume responsibility for identification of the content and how this should be structured. Today, academics are responsible for developing learning tools that require both knowledge of LMS and pedagogical dialogues with ICT expertise (Laurillard 2002).

In the past, academics have been responsible for independently developing and implementing teaching and learning methods. The advent of LMS requires more of academics, who will also need to:

- Adapt to new forms of communication and online dynamics with students
- Become familiar with new delivery methods
- Assume new virtual identities
- Create new relationships between administrative staff and multimedia and software developers in the collaborative development, implementation and evaluation of differing levels of sophisticated online learning materials (Sherman 2006, Ellis & Goodyear 2010).

Ownership is a further potential issue for academics who are the principal designers of E-learning resources. University policies should include more than identification of the developer by ultimately ensuring processes are in place that allow the tracking of ownership, content developers' responsibilities, the passing of ownership from academic to academic, and details of what should happen when a resource has no owner and therefore no one to ensure continued relevance, accuracy and timeliness (Chiao-Chen 2013).

The literature has shown that use of LMS is not without problems or concerns for nurse academics. Students entering universities bring with them skills and experiences, some of which will assist them in using ICT and E-learning technologies. However, many students are not well equipped with adequate CIL to access the learning they need, which is located in the LMS.

1.5.4 Nurse academics' and students' concerns about ICT and E-learning

Academics involved in the educational preparation of nursing health professionals are facing ever increasing challenges. These include, but are not limited to, financial constraints, dwindling quality clinical placements (Hall 2006, Halcomb, Peters *et al.* 2012), the increasing mean age of nurse academics, workforce retention/flexibility issues and teaching facilities that are not fully equipped to take advantage of the extensive educational resources available on the internet (Campbell & McDowell 2011).

Research of academics' experiences in the early stages of E-learning development and implementation revealed that academics were concerned about the changes to their roles. They had to progress from being in the classroom where their practice could be demonstrated and modelled to being a facilitator on the side, with few face-to-face experiences with nursing students (Cooksey, Kohlmeier *et al.* 2000, Clark 2002, Harden 2002). Since early 2000, academics and students have expressed dissatisfaction with teaching and learning in the online environment (Olson, Cohn *et al.* 2000, Childs, Blenkinsopp *et al.* 2005) and the quality of E-learning being offered (Thiele, Allen *et al.* 1999, Kenny 2000, Olson, Cohn *et al.* 2000, Clark 2001, Meyer 2001, Washer 2001, Childs, Blenkinsopp *et al.* 2005). Nurse academics are not being offered the opportunity to be involved in E-learning resource development, implementation and evaluation, resulting in resources that are not fit for purpose (Pande & Hart 1998, Lowry & Johnson 1999, Petrusa, Issenberg *et al.* 1999, Olson, Cohn *et al.* 2000, Meyer 2001, Ouellette & Briscoe 2002).

Another concern is that currently, many academics in general, not just nurse academics, are continuing to build their level of ICT skills when working in the E-learning environment despite a lack of flexible technical support from people who also have educational technology design qualifications (Olson, Cohn *et al.* 2000, Meyer 2001, D'Alfonso & Halvorson 2002). Some academics, because of their lack of skills and negative ICT experiences in course design, development and delivery of E-learning experience high levels of technophobia, computer anxiety and lack of IT confidence (Kenny 2000, Clark 2001, Meyer 2001, Harden 2002, Ahmed 2010).

Finally, much of the academics' workload has increased but remains unrecognised because the essence of E-learning is invisible (Heijstra & Rafnsdottir 2010, Button, Harrington *et al.* 2014, Kale & Goh 2014, Debuse & Lawley 2015). Administrative processes involved with the change from paper-based to networked online administration have moved a large component of computer-based administration onto academic staff members, resulting in increased workload (Petrusa, Issenberg *et al.* 1999, Meyer 2001). In light of these concerns from nurse academics, consideration needs to be afforded to the requirements of students who are entering universities to commence their undergraduate nursing degrees.

1.6 Who are the nursing students of today?

The ability to be responsive to the differences in distribution of ages within and between student and academic cohorts is of particular importance to the successful creation and implementation of E-learning resources. On one hand, the majority of Australian academics are “Baby Boomers” (1946-1964) or “Generation Xers” (1963-1980) who did not “grow up” with sophisticated computer technology. On the other hand, younger academics may possess an ‘‘information-age mindset’’ and accept online learning as natural and necessary (Frand 2000), but may lack pedagogical knowledge.

Students include Baby Boomers (1946-1964), Generation Xers (1963-1980) and the “Millennial Generation”, with the majority coming from The Millennial Generation (1980-2000), often referred to as the “Net Generation” because of their assumed level of CIL and desire to be connected electronically. The majority “information-age mindset’’ students now enter university with expectations for advanced technologies consistent with their experience of leading-edge technology (Frand 2000, Gilbert 2001). Yet results from nursing research reveal that students commencing their nursing studies do not have the required CIL skills (Ward & Moule 2007, Bond 2009, Levett-Jones, Kenny *et al.* 2009, Jones & Donelle 2011, Robertson & Felicilda-Reynaldo 2015).

Having discussed some of the challenges facing nursing students and academics around the ability to engage and learn with ICT and associated E-learning technology, it is appropriate to now consider how learning occurs in the online environment.

1.7 Constructivist learning theory and E-learning

Although there has been a plethora of small scale, localised descriptive studies exploring the pedagogical impact of E-learning and LMS in recent years, such studies are still inadequate in providing an understanding of the underpinning practical and theoretical issues (Phipps & Merisotis 1999, Flowers, Pascarella *et al.* 2000, Kezar 2000, Kuh & Hu 2001, Kuh & Vesper 2001). However, a study by Moule (2007) resulted in the development of the “E-learning ladder”, a conceptual framework depicting how leaners use both online and face-to-face learning (blended learning). In this case, they are able to move from instructivist “passive” learning to constructivist learning approaches in which learning is built on previous experiences.

The learner moves up the ladder to the final step where they are working in a group environment, constructing their own learning in an online Community of Practice (Moule 2007) (see Figure 1-1).

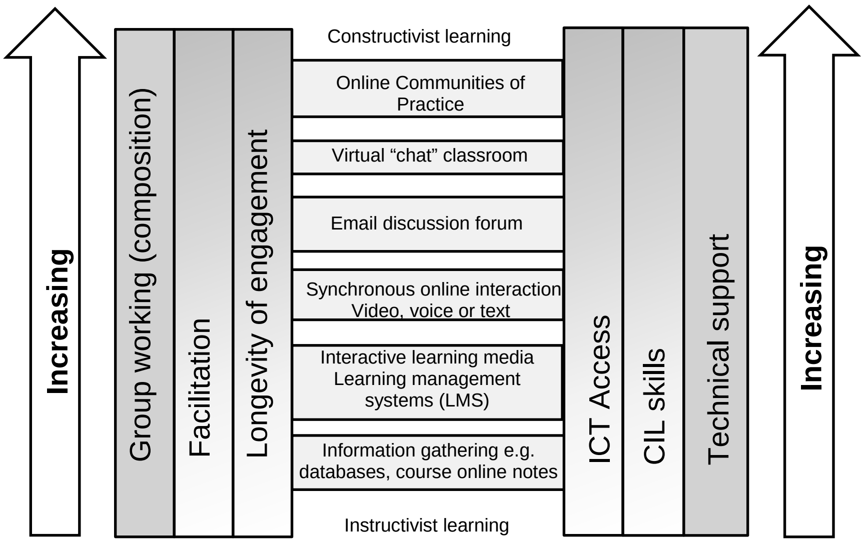

Figure 1-1 A conceptual model of online learning - The E-learning ladder, instructivist to constructivist (Moule 2007 *p.* 41)

Figure 1-1 shows the learner starting at the bottom of the ladder and, with adequate support to the right that includes increasing ICT access, CIL skills and technical support, and to the left that includes increasing length of engagement, level of facilitation and working in groups, using E-learning to move up from instructivist to constructivist learning to achieve the lifelong skills required as a health professional in an online Community of Practice (Moule 2007). There are many similarities between this conceptual framework and the educational philosophical work of John Dewey.

1.7.1 John Dewey and learning from experience

Learning can be defined as a persistent change in human behaviour resulting from a learner’s interaction with the world (Driscoll 2000). John Dewey believed that for learning to occur there needs to be “a theory of experience in order that education may be intelligently conducted upon the basis of experience” (Dewey, Boydston *et al.* 1985) [LW 13:17]. Students and academics need the required support for learning to be successful in the E-learning environment. Dewey’s pragmatic view of the world and the influences of experience on learning are discussed further in the methodology chapter.

1.8 The impetus for the study

The preceding overview of some of the current factors impacting nursing education for both students and academics gives some insight into the impetus for the study described in this thesis. As a nurse academic educating undergraduate nursing students for many years, the researcher realised from observations that while students were able to use their mobile phones and interact via social media, generally they did not possess the CIL skills required to locate, critically analyse and apply the information required for their studies.

An additional impetus for this research came whilst the researcher was working with a group of third year final semester undergraduate nursing students who were required to locate current evidence-based practice and use this to reflect and critique practice they witnessed whilst on placement. Students revealed they did not know how to use the library databases for literature searching and would use sources outside the university such as Google™, but with limited success. When questioned why they were not using the library databases, the responses were that the databases were too hard to use, gave too many results and students could not narrow their searches after entering a few keywords.

The final impetus was the current worldwide computerisation of health care technology, including information systems, which directs that it is imperative for undergraduate nursing students and graduates to possess competent CIL skills to learn about, and provide, safe patient care. The issues facing nursing students and academics involving use of computers and their associated technology for E-learning in undergraduate nursing programs in Australia are the focus of this thesis.

1.8.1 Equipping the nurses of the future

Nursing graduates entering the workforce today are expected to have baseline information retrieval and usage skills (Nursing and Midwifery Board of Australia 2016). Nursing graduates will be working in a health care environment that is moving to online patient records and increased computer use. Thus, they will need proficient CIL skills so that they will be in a position to deliver information literate, competent, safe care. Overarching all of these changes is the federal government's commitment to increase every citizen's access to, and use of, online environments with the National Broadband Network (NBN) rollout across Australia. The NBN is an Australian national wholesale-only, open-access data network (Australian Government 2017).

Once the NBN is in place, the federal government envisages that learners will be able to access learning services and resources from multiple learning providers nationally and internationally. The well-equipped computer and IT literate lifelong learner will transition from primary school to secondary school to vocational education and training (VET) or university, and to the workforce (Hendrick & Williams 2009). These strategic changes will have an ongoing effect on nursing education and the nursing workforce.

The health care environments in which graduates are employed require them to be able to think critically and make informed judgements using patient assessment and the interpretation of vast amounts of clinical data. Today, more and more of this information is being stored as electronic data. One such change already occurring is the move to Personally Controlled Electronic Health Records (PCEHR); secure, electronic records of a person's medical history that are stored and shared in a network of connected systems. Information in a PCEHR can be accessed by the person and health care providers (authorised by the person concerned). In the future, as the PCEHR becomes more widely available, people will be able to access their own health information any time it is needed and from anywhere in Australia (The National E-Health Transition Authority Limited 2011). The transfer to a fully electronic health care information communication system will have a significant effect on the educational preparation of nursing/midwifery graduates. If these novice health professionals are to be "job ready", they will need to be familiar and literate with the required systems.

This thesis provides evidence that E-learning in nursing education in Australia is not being accessed and used to its espoused full potential due to a number of factors involving students, academics and university infrastructure. As stated previously in this chapter, research has identified some of these factors, however, formalised solutions have been elusive for students, academics and universities, resulting in frustration and a less than optimal teaching and learning environment. Questions that need to be asked include: Is the E-learning management system the way students want to learn about nursing? Do academics want to engage with students in this "disconnected" medium?

1.9 Scope of the study

The focus of this inquiry was undergraduate nursing students and academics involved in the learning and teaching of undergraduate nursing education in Australian university-based programs.

1.10 The research purpose

Many academics are now experiencing the largest change in the way they are involved with teaching and learning in nursing and midwifery education since the transition in Australia from hospital-based training to the higher education sector. The purpose of this research was to increase understanding about how ICT is impacting on learning for nursing students and the academics delivering contemporary undergraduate nursing curricula in Australian universities.

Simultaneous data collection from undergraduate nursing students and nurse academics in Australia provided the researcher with the opportunity to identify current issues when using ICT and E-learning. Analysis of both qualitative and quantitative data in this unique study identified new knowledge and understandings about the experiences of these two populations.

1.11 The research aim and objectives

The aim of the research was to explore and identify students' and academics' experiences of, and perspectives about, current issues relating to E-learning and its associated ICTs, and their use in nursing education in Australian university undergraduate nursing programs. The specific objectives addressed were:

1. To determine the issues involving E-learning and its associated technology for undergraduate nursing students in Australia.
2. To determine the issues involving E-learning and its associated technology for nurse academics teaching in undergraduate programs in Australia.

The researcher came to this inquiry with many years of experience as a registered nurse in both the clinical field and in education. It did not seem to be particularly out of place to wish to combine different perspectives and approaches in a single study. As both a clinician and an academic, the researcher simultaneously gathered information from multiple sources to assist in gaining a greater understanding when teaching students. Becoming a nurse involves studying many factors that impinge on the people's health, such as sociology, psychology, anatomy, physiology, microbiology and anthropology. Meleis (2012) suggested that in a discipline that deals with human beings, more than one theory is necessary to explain, describe, predict and change all that discipline's phenomena.

This researcher rejects the idea that one paradigm is superior to another. She is committed to the acceptance of difference, and the importance of multiple and diverse perspectives. The complexity and pluralism of the contemporary world surely demands such commitment.

All researchers approach their work with a set of assumptions about the social world, the value of knowledge and the purpose of research. Whether these assumptions pre-empt a formal philosophy around paradigms or a more "crude mental model" (Bredo 2015), the activity of social enquiry requires an underlying conceptualisation of the situation. How the researcher views the nature of reality (ontology), how knowledge is gained about what we know (epistemology), the role the researcher's values play in the inquiry (axiology), the process of the research (methods) and the language surrounding the research (rhetoric) will all influence how the researcher conducts and reports the findings of their inquiries (Guba 1990, Creswell & Plano Clark 2007). It is because of this researcher's own philosophical assumptions and values, and the nature of this research that the paradigm of pragmatism was selected as the most appropriate theoretical perspective to guide this study of E-learning in nursing education.

1.12 The research format

The study used the philosophical underpinnings of pragmatism as conceptualised by John

Dewey. The American pragmatist John Dewey (1859–1952), in addition to being a philosopher, was also a foundation educationalist who believed that learning must be based in real life experiences. The E-learning study here used an exploratory, sequential, mixed methods approach that followed a modified eight step model originally developed by Johnson and Onwuegbuzie (2004). There were two sequential phases. Phase 1 was based in the qualitative research paradigm. Focus groups were held and themes identified. Phase 2 was situated in the emprico-analytic quantitative paradigm and involved the development of two online questionnaires based on the findings from Phase 1. The two online questionnaires, one developed for students, the other for academics, were delivered across Australia via email and hyperlink to 19 schools of Nursing and Midwifery that agreed to participate in the study. Data resulting from the two questionnaires was statistically analysed, then integrated to produce a single data set from which recommendations were developed.

1.13 Original contribution to knowledge

The thesis' original contribution to knowledge is its affirmation that the invisible nature of CIL continues to obstruct nursing students and academics from fully realising the potential of E-learning. The research findings stress the urgency for curriculum development to incorporate CIL to ensure graduates have the capability to provide safe, evidence-based nursing care.

1.14 Thesis structure

Overall, this thesis comprises 10 chapters.

Chapter 1: Introduction has described the significance and context of this study, and established mixed methods as the most appropriate research framework.

Chapter 2: Literature Review reveals the complexity of issues around E-learning, including the worldwide increase in ICT, how this is impacting nursing education, and how nursing and midwifery students' and academics' CIL levels impact their engagement with E-learning.

Chapter 3: Methodology describes the mixed methods used, underpinned by a philosophy of pragmatism. The chapter describes the interpretive and empirico-analytical elements, and the philosophical decisions that were made in developing the two phases of the research design.

Chapter 4: Research Methods describes the qualitative methods for conducting the focus group interviews with undergraduate nursing and midwifery students and nurse academics, and the interpretive data analysis from this phase, followed by a description of the quantitative methods used to collect data via online questionnaires in Phase 2, and the statistical and content analysis used in this phase.

Chapter 5: Phase 1 Qualitative Findings presents the findings from the focus groups and identifies the themes that formed the basis of the two questionnaires developed in Phase 2.

Chapter 6: Development of the Questionnaires outlines the rationale for the questionnaire development process, and discusses the validation of the two quantitative questionnaires used in Phase 2.

Chapter 7: Phase 2 Quantitative Findings presents the descriptive and inferential statistical analyses of the results from the student and academic online questionnaires.

Chapter 8: Phase 1 and Phase 2 Data Integration describes the integration of data sets arising from the Phase 1 and Phase 2 findings to produce the new integrated findings from the student and academic data sets following the mixed methods research design.

Chapter 9: Discussion of Integrated Findings provides an additional understanding of the phenomena through discussing the integrated findings using relevant literature. The study's limitations are also discussed following the researcher's reflection on the overall process of conducting the study.

Chapter 10: Conclusions and Recommendations discusses the study's outcomes and recommendations, and the future direction of further research.

1.15 Summary

This chapter has presented a brief summary of key points in the history of ICT for education; an overview of worldwide trends in ICT innovations, including E-learning and their applications to nursing; a discussion of worldwide concerns related to CIL and its impact on student learning and academics' work, and how ICT and E-learning are being used in nursing education; and a description of the current mix of nursing students and how their ICT skills are enhancing or hindering their learning in the online environment. The constructive learning theory known as the "E-learning ladder", developed by Moule (2007), was introduced to explain how learning can be supported in the online environment, and the impetus for the current study was described. Finally, the chapter the research aim and objectives were stated, followed by an outline of the thesis chapters.

The next chapter provides a review of the literature concerning E-learning in higher education, including undergraduate nursing education. Key issues are identified relating to E-learning, pedagogy and CIL, and how workload is affected for both students and academics. The review and the key themes identified provided the basis for formulating the focus group questions and the two online questionnaires implemented to achieve the study's objectives.

Chapter 2 Literature Review

2.1 Introduction

Today's students' engagement with digital technology is far removed from the conventional literacy demands of university study. Undergraduate nursing students increasingly use E-learning throughout their courses (Elder & Koehn 2009, Timmins & Dunne 2009, Jetté, Tribble *et al.* 2010). Educational outcomes achieved from information computer technologies (ICT) in the 21st century, whether through a standalone course or as a component of blended learning, are expected to surpass of those earlier forms of distance education (Zhao, Lei *et al.* 2005). The expectation is that computer use in education will achieve a situation in which the "Internet Shifts Focus to Higher Order Thinking" (AL-Bataineh & Brooks 2003 p. 477). In an attempt to respond to the rapid growth in the use of digital technologies and social networking amongst a generation of university students who use this technology as part of their everyday lives, tertiary Institutions are now committed to a substantial investment in ICT (Laurillard 2009, Garrison 2011). Accordingly, nurse academics are expected to incorporate information computer technology into their teaching (Bristol 2005, Mancuso 2009, Nguyen, Zierler *et al.* 2011) at a synthesis or evaluation level of expertise. Therefore, they need to be cognisant of, and prepared to oversee, the development of online learning activities that require students to:

- accept a degree of self-initiative,
- be involved in identifying and analysing germane evidence, and
- gain complex problem-solving skills. (AL-Bataineh & Brooks 2003).

Although there have been thousands of studies of online learning, only a small number of rigorous published studies exist, thus caution is required in generalizing these results (Means, Toyama *et al.* 2010). As Goodfellow and Lee (2013) purport, little is known about the ways in which computer literacies, learning and technologies intersect with current students as learners within and outside the formal education curriculum, or the experience of academics with the development and implementation of E-learning. Although sophisticated software and online Learning Management Systems (LMS) possess the potential to increase the interactivity and dynamism of learning, it is also essential for universities to be vigilant in ensuring the technology does not overshadow the communication of content matter (Miller 2011).

The review presented in this chapter aimed to identify literature related to ICT in undergraduate nursing programs and the university sector worldwide. The researcher's intention was to build a current knowledge base to justify the study described in this thesis by highlighting gaps in the current literature that need further investigation (Marshall 2010), thereby accomplishing several important objectives articulated by Aveyard (2014). The literature review situated the context of the study and clearly defined what was and was not within the scope of the investigation; it justified the study design (Aveyard 2014). It also positioned existing literature in a broader scholarly and historic context.

This literature review not only reports on the claims in the existing literature but also critically examines the research methods to substantiate assertions arising from it (Machi & McEvoy 2012). This type of comprehensive review allowed the researcher to summarise the existing literature and synthesise it in a way that permitted a new perspective. Accordingly, it formed the basis for a sophisticated theoretical and methodological research design, thereby improving the quality and usefulness of the research reported in this thesis (Notar & Coile 2010).

This chapter outlines the methods used throughout the review, including the search strategy, processes used in the selection of studies, rationale for inclusion and exclusion criteria, and the resulting search outcomes. It describes the analysis of theoretical frameworks and methodologies to assess the studies' strengths and weaknesses, and thematic analysis to identify and extract common themes. It presents the four main themes identified and their relevant sub-themes, and discusses the results of the review incorporating level of evidence, data collection and data abstraction. The chapter concludes with a discussion on the implications of the findings from the literature reviewed and the literature's strengths and weaknesses.

2.2 Search strategy

A systematic search of the literature was performed using a selection of electronic databases to locate articles that examined at least one of three broad categories: undergraduate nursing education; undergraduate midwifery education; and computer education technology and E-learning. A search of the grey literature was also undertaken to trace unpublished research or non-commercial publications. Although the main focus was on primary research articles, secondary sources such as literature reviews were accessed to further inform the study regarding the contemporary contexts of E-learning in nursing and other education programs.

The electronic databases listed below were used to search for primary sources, published between 2006 and 2016, to examine available contemporary knowledge relating to IT, E-learning and undergraduate programs. Use of Boolean operators (AND, OR, NOT or AND NOT) to combine or exclude keywords assisted in widening, narrowing and combining search results:

- Online databases through Flinders Library including CINAHL, MEDLINE, OVID, ProQuest Central, PubMed, ERIC (Educational Resources Information Center) and Science Direct.
- General internet web pages such as Google and Google Scholar.
- Manual searches based on the reference lists and bibliographies of articles, reports and books considered relevant to this study.

The following keywords were used in the search:

- E-learning, blended learning, distance learning, compu* (* asterisk wildcard symbol) assisted learning, computer based learning, computing literacy, digital learning, electronic learning, mobile learning, online learning
- Information literacy, compu* literacy, information communication technology (ICT), information technology (IT)
- Nursing, midwifery, student, academic, educator, teacher, nurse academic, nurse educator, nurse teacher, higher education, tertiary education, undergraduate, undergraduate.
- The searches were then repeated adding the following key words: issues, barriers, perceptions, attitudes, readiness and concerns.

2.2.1 Design

A thematic appraisal was undertaken. Specific themes discussed in the reviewed literature were identified using a six step process suggested by Braun and Clarke (2006) (see Table 2-3 in section 2.2.4, “Data abstraction and synthesis”).

2.2.1.1 Inclusion and exclusion criteria

Articles in the study concerned undergraduate students’, undergraduate nursing and/or midwifery students’, and/or nurse academics’ issues and perceptions relating to E-learning and its associated technology. All studies where ICT was used as part of students’ course of studies or academics’ everyday activities, including teaching, research and administrative requirements, were included. Studies relating to academics’ other than nurse academics’ issues and perceptions related to E-learning and the associated technology were also included, as were papers with a focus on the integration of E-learning technologies into the classroom from either the student’s or teacher’s perspective.

Included studies were published between January 2006 and February 2016 in peer reviewed journals. This time limit was chosen because of the rapid changes in ICT worldwide and to ensure the studies related to the ICT currently used for education. Papers published before 2006 and/or where the research focused on the development and evaluation of E-learning components within a program of study were excluded.

2.2.1.2 Appraisal tools used in the review

Four evaluation tools were used to appraise the 58 studies found. First the Australian National Health and Medical Research Council (NHMRC) Evidence Hierarchy was used to evaluate all studies (National Health and Medical Research Foundation 2011). Second, specific appraisal tools for each type of research were: Long, Godfrey *et al*. (2002a) for quantitative studies; Long, Godfrey *et al*. (2002b) for mixed methods studies developed by the Health Care Practice Research and Development Unit from the University of Leeds; and Letts (2007) for the qualitative studies developed by the researchers from the Mc Master University Ontario. The reviewed studies' theoretical frameworks and methodologies were analysed to assess the studies' strengths and weaknesses (see Appendix 2a).

2.2.2 Search outcomes

Initial searches identified 531 studies (see Figure 2-1), which were screened for relevance by reading the title and abstract. As a result, 362 studies were discarded as not directly relevant, leaving 167 for more detailed examination against the inclusion criteria. A further 112 articles were judged as not meeting the selection criteria. Further appraisal of the remaining 66 articles led to the discarding of 11 more, which were deemed not to meet the appraisal criteria, leaving 58 studies for thematic review.

2.2.3 Results from the appraisal process

2.2.3.1 Study locations

Studies examining E-learning in higher education and undergraduate nursing were conducted across 14 countries. The largest number of included research studies came from the USA (n=19). The second largest number of studies came from the UK (n=11) and then Australia (n=10). No recent papers published meeting the inclusion criteria were found involving Latin American countries. Table 2-1 provides a list of all studies and their originating country.

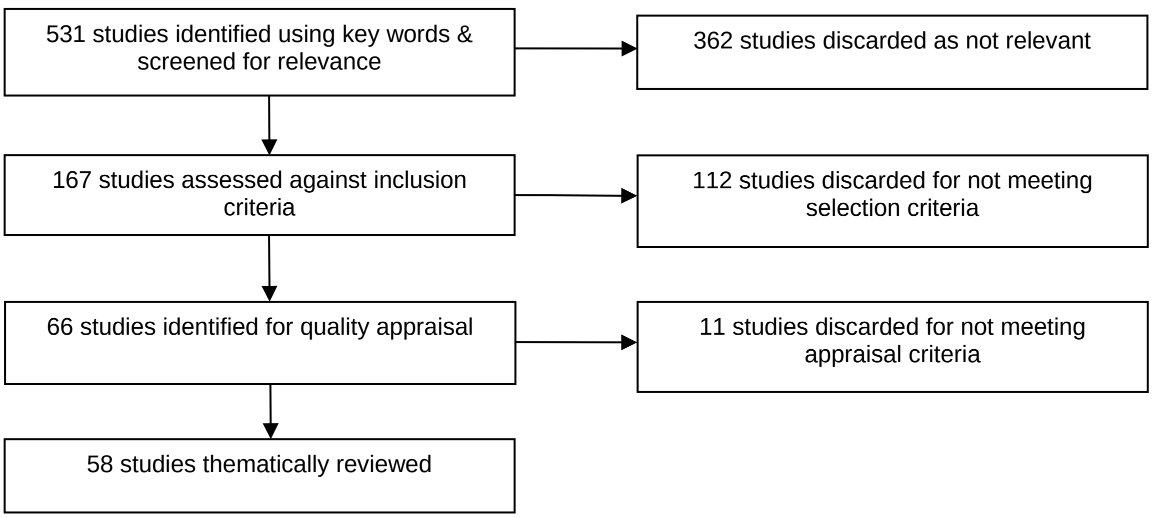

Figure 2-1 Summary of search and appraisal process

Table 2-1 Location and year of each included study

Country	Author and year (n=56)
Australia (n=10)	Bembridge *et al.* (2011); Creedy (2007); Eley *et al.* (2008); Farrell *et al.* (2007); Levett-Jones *et al.* (2009); Nayda & Rankin (2009); Parkes *et al.* (2015); Taylor and Newton (2013); Yang *et al.* (2013)
Belgium (n=2)	Verhoeven *et al.* (2012); Verhoeven *et al.* (2014)
Canada (n=2)	Jetté *et al.* (2010); Saadé *et al.* (2013)
Finland (n=2)	Islam (2013); Jokinen and Mikkonen (2013)
Greece (n=1)	Deltsidou *et al.* (2010)
Ireland (n=3)	Kelly *et al.* (2009); Risquez and Moore (2013); Smyth *et al.* (2012)
Israel (n=1)	Gonen *et al*. (2016)
Norway (n=2)	Habib and Johannesen (2014); Jacobsen and Andenæs (2011)
New Zealand (n=2)	MacCallum *et al.* (2014); Scott *et al.* (2008)
Singapore (n=1)	Kowitlawakul *et al.* (2015)
Taiwan (n=1)	Yu *et al*. (2013)
Turkey (n=1)	Celik and Yesilyurt (2013)
UK (n=11)	Allan *et al.* (2012); Anderson *et al.* (2013); Blake (2009); Bloomfield and Jones (2013); Bond (2009); Edmunds *et al.* (2012); Mitchell *et al.* (2007); Moule *et al.* (2010); Petit dit Dariel, Wharrad *et al.* (2012); Petit dit Dariel, Wharrad *et al.* (2014); Safford and Stinton (2014)
USA (n=19)	Cooper (2008); Crews *et al.* (2009); Duke & Asher (2012); Elder & Koehn (2009); Fathema *et al.* (2015); Green (2011); Killion *et al.* (2011); Lloyd *et al.* (2012); Nguyen *et al.* (2011); Maag (2006); Murray & Pérez (2014); Porter *et al.* (2015); Regan *et al.* (2012) ; Robertson & Felicilda-Reynaldo (2015); Roby *et al.* (2013); Smith *et al*.(2009); Walker *et al.* (2006); Weiner (2014); Zelick (2013).

2.2.3.1 Study design

The most frequent research method used in the 58 included studies was quantitative (n=33), followed by mixed methods (n=16) and qualitative (n=9, see Appendix 2a,b,c)

2.2.3.2 Levels of evidence

According to the NHMRC evidence hierarchy, all studies were either level III-3 (comparative study without concurrent controls; n=41) or level IV (case series with either post-test or pre-test; n=15) (Commonwealth of Australia 2000) (see Appendix 2d). All 33 quantitative studies used different tools to collect their data. Table 2-2 lists the 16 studies that provide an audit trail (Koch 2006) detailing how validity or trustworthiness was determined.

Power analysis to determine sample size for the questionnaires was not mentioned in any of the reviewed studies (Muthén & Muthén 2002, Wolf, Harrington *et al.* 2013). The wide variety of questionnaire tools created difficulties in comparing results across studies, which made direct comparison impossible.

Table 2-2 Indicators of validity for quantitative studies and trustworthiness for qualitative studies (n=16)

Author(s)	Quantitative	Qualitative
1. Fathema *et al.*, 2015	✓	
2. Kowitlawakul *et al.*, 2015	✓	
3. Petit dit Dariel, Wharrad *et al.* 2014		✓
4. Verhoeven *et al.*, 2014	✓	
5. Celik & Yesilyurt, 2013	✓	
6. Islam, 2013	✓	
7. Yu *et al.*, 2013	✓	
8. Lloyd *et al.*, 2012	✓	
9. Petit dit Dariel, Wharrad *et al.* 2012		✓
10. Verhoeven *et al.*, 2012	✓	
11. Bembridge, Levett-Jones, & Jeong, 2011		✓
12. Deltsidou, Voltyraki, Mastrogiannis, & Noula, 2010	✓	
13. Jetté *et al.*, 2010	✓	
14. Elder & Koehn, 2009	✓	
15. Eley, Fallon, Soar, Buikstra, & Hegney, 2008	✓	
16. Walker *et al.*, 2006	✓	
Total n=16	**n=13**	**n=3**

2.2.4 Data abstraction and synthesis

The 58 studies were divided into those which focused on students (n=31) or academics (n=20), and those exploring both students' and academics' issues (n=7) (Levett-Jones, Kenny *et al.* 2009, Nayda & Rankin 2009, Moule, Ward *et al.* 2010, Roby, Ashe *et al.* 2013, Taylor & Newton 2013, MacCallum, Jeffrey *et al.* 2014, Parkes, Stein *et al.* 2015, Gonen, Sharon *et al.* 2016). Thematic appraisal of the studies was undertaken using an adaptation of the six step thematic coding process suggested by Braun and Clarke (Braun & Clarke 2006) to identify, select, differentiate and dissect recurring themes (see Table 2-3).

Table 2-3 Phases in the thematic appraisal used in this review

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Braun, V. & Clarke, V. (2006). "Using thematic analysis in psychology." Qualitative Research in Psychology 3(2): 77-101. page 87. 10.1191/1478088706qp063oa

Source: Braun & Clarke (2006, *p.* 87)

Potential themes were reviewed against the entire data set and a map of the analyses was created to show the researcher which themes originated from which studies. The refining of the themes was the next stage in which the researcher decided what names clearly defined each theme and what separated them from each other to ensure there were no overlapping themes (Braun & Clarke 2006).

2.3 Themes identified from the review

Following the analysis of the reviewed studies, four themes were identified. No single theme was found across all articles. The themes and their empirical sources are detailed in Appendix 2a,b,c. The four themes were:

1. Computer information literacy skills (CIL) were low
    - Sub-theme 1A Student CIL skills were low
    - Sub-theme 1B Student computer anxiety
    - Sub-theme 1C Academic CIL skills were low
2. Students wanted to use E-learning
3. Influences impacting students' ability to use E-learning
4. Influences impacting academics' ability to use E-learning
    - Sub-theme 4A Internal influences
    - Sub-theme 4B External influences.

2.3.1 Theme 1: Computer information literacy (CIL) skills were low

The review identified 31 of the 56 studies had a theme of low CIL skills for students and/or academics (see Table 2-4). The location of the studies provided evidence of low CIL skills as an ongoing issue for students and academics worldwide, as maintained by the 2015 *Horizon* report into higher education (Johnson, Adams Becker *et al.* 2015).

Table 2-4 Studies that found low CIL skills in students and academics

Source	Location	Student	Academic
1. Allan *et al* 2012	UK		✓
2. Anderson *et al*. 2013	UK	✓	
3. Bembridge *et al*. 2011	Australia	✓	
4. Bond 2009	UK	✓	
5. Celik and Yesilyurt 2013	Turkey	✓	
6. Creedy *et al*. 2007	Australia	✓	
7. Crews *et al* 2009	USA	✓	✓
8. Deltsidou *et al.* 2010	Greece	✓	
9. Duke & Asher 2012	USA	✓	
10. Eley *et al.* 2008	Australia	✓	

Source	Location	Student	Academic
11. Gonen *et al*. 2016	Israel	✓	✓
12. Green 2011	USA		✓
13. Jacobsen & Andenæs 2011	Norway	✓	
14. Jetté *et al*. 2010	Canada	✓	
15. Jokinen & Mikkonen 2013	Finland		✓
16. Killion *et al.* 2011	USA	✓	
17. Levett-Jones *et al.* 2009	Australia	✓	
18. Maag 2006	USA	✓	
19. Mitchell *et al.* 2007	UK	✓	
20. Murray & Perez 2014	USA	✓	
21. Nayda & Rankin 2009	Australia	✓	✓
22. Nguyen *et al.* 2011	USA		✓
23. Parkes *et al*. 2015	Australia	✓	
24. Robertson & Felicilda-Reynaldo 2015	USA	✓	
25. Safford & Stinton 2014	UK	✓	
26. Scott *et al*. 2008	New Zealand	✓	
27. Smith *et al*. 2009b	USA & Canada	✓	
28. Taylor & Newton 2013	Australia	✓	
29. Verhoeven *et al*. 2012, 2014	Belgium	✓	
30. Yang *et al*. 2013	Australia	✓	
31. Weiner 2014	USA		✓
Total= 31		**n=26**	**n=8**

2.3.1.1 Sub-theme 1A: Students with low CIL skills

As highlighted in Appendix 2a,b,c, four studies found that students entering university overestimated their skills. The students possessed skills to manage their mobile phone and social media but were not equipped with sufficient CIL skills required for their studies (Jacobsen & Andenæs 2011, Duke & Asher 2012, Parkes, Stein *et al.* 2015, Gonen, Sharon *et al.* 2016).

It would appear from the reviewed literature that university academics also overestimated the CIL of commencing students (see Appendix 2a,b,c). Verhoeven (2012) found that all first year students (n=714) from a Belgium university, whether studying law, medicine, economics, nursing, education, women’s studies or music, were not offered any form of ICT instruction when they commenced their studies. Students stated that on commencing and completing their university studies, they had not received formal instruction in using ICT. Further, they had received no guidance on how to develop their CIL skills over the length of their enrolment.

A study that included the academics’ points of view (Weiner 2014) found that the majority of teaching academics assumed they had the required CIL and consequently did not actively teach these in class. Some academics did not see teaching CIL skills as their role; instead, they focused on specific content delivery. Yang *et al*. (2013) found that students who entered university studies through the Vocational Education and Training (VET) pathway also lacked CIL skills in using the LMS; they were unable to print their assignment on the university printers and could not check their library record online (Yang *et al*. 2013).

As students moved through their studies, it was assumed their CIL skills would improve. However, in three studies (Jacobsen & Andenæs 2011, Murray & Perez 2014, Robertson & Felicilda-Reynaldo 2015), academics assessed students' CIL skill level on graduation and found students were still unable to search databases to locate information required for assignments.

Two studies (Scott, Gilmour *et al.* 2008, Levett-Jones, Kenny *et al.* 2009) found that nursing students did not realise that CIL skills would be required to function effectively in the health care workforce on graduation. Levett-Jones *et al*. (2009) made recommendations that throughout the curriculum nurse academics needed to make more overt links to CIL skills and the work of the registered nurse on graduation. These recommendations were supported by Eley, Fallon *et al*. (2008), Bond and Procter (2009) and Nayda and Rankin (2009).

In addition, Scott, Gilmour and Fielden (2008) found that nursing students' low level of CIL skills meant they did not recognise the need to assess their patient's level of CIL, which may be required to access the patient's health information from the internet. The move from paper-based to computer-based (electronic) health records required all health professionals to assess their patient's level of CIL as a component of the overall health assessment (Levy *et al*. 2015).

Low CIL skill issues are not new in nursing education. Studies by Bond (2009) and Maag (2006) warned that nursing education curricula back in 2006 did not equip nursing graduates with the essential CIL skills they needed to effectively use the internet; skills expected of them on graduation.

2.3.1.2 Sub-theme 1B: Students' computer anxiety

Computer anxiety is defined in this literature review as "the tendency of individuals to be uneasy, apprehensive, or fearful about current or future use of computers" (Parasuraman & Igbaria 1990 p. 329). Students in five of the reviewed studies self-reported that low CIL skills caused stress and anxiety (see Appendix 2a,b,c). Students reported increased anxiety when trying to access and learn from unfamiliar programs within the university, such as the LMS (Levett-Jones, Kenny *et al.* 2009, Celik & Yesilyurt 2013, Saadé, Kira *et al.* 2013, Yang, Catterall *et al.* 2013, MacCallum, Jeffrey *et al.* 2014). Self-reported computer anxiety did not occur in any of the reviewed academic focused studies.

2.3.1.3 Sub-theme 1C: Academics with low CIL skills

Eight studies found that academics had low CIL skills (see Table 2-4). These studies found that academics were aware they lacked the required skills but cited lack of technical support, and time to learn and incorporate additional CIL skills into their current pedagogy, as barriers. The study from Israel (Gonen, Sharon *et al.* 2016) described how nurse academics were keen to improve their knowledge related to CIL and Nursing Informatics (NI) skills, and how tailored professional development prior to integration of NI into the undergraduate nursing curriculum successfully achieved this improvement.

2.3.2 Theme 2: Students wanted to use E-learning

In 11 of the 58 reviewed studies, students reported positive aspects about E-learning, including flexibility, rapid access to online library resources, perceived improved learning, and rapid communication with academic staff and other students (see Table 2-5).

Table 2-5 Reasons students want to use E-learning

Sources	Flexibility	Perceived Improved learning	Access to resources	Connection with other students	Communication with academic staff
Creedy *et al.*, 2007	✓	✓			
Edmunds *et al.*, 2012	✓		✓		✓
Farrell, Cubit, Bobrowski, & Salmon, 2007	✓		✓		✓
Islam, 2013	✓	✓		✓	✓
Kelly, Lyng, McGrath, & Cannon, 2009	✓		✓	✓	
Killion *et al.*, 2011	✓	✓		✓	
Maag, 2006		✓	✓	✓	
Mitchell, Ryan, Carson, & McCann, 2007	✓	✓	✓		
Roby *et al.*, 2013	✓	✓	✓		
Smith, Passmore *et al.* 2009	✓	✓		✓	✓
Smith, Salaway *et al.*, 2009	✓	✓		✓	✓
Total n=11	**n=10**	**n=8**	**n=6**	**n=6**	**n=5**

Flexibility, found in 10 studies (see Table 2-5), was the most important aspect of E-learning. Students liked being able to study anywhere internet access was available and at their own pace. Five studies found students enjoyed the online learning environment because it allowed them to get to know each other outside the classroom. They felt more motivated to work collaboratively, assisting each other's learning. Increased access to the internet worldwide and a greater variety of devices for accessing university studies should also increase these positive aspects of E-learning.

The largest study (n=30,616) was part of a cohort study conducted by Smith, Salaway *et al*. (2009) in the USA and Canada. It found an increase in mobile phones and laptop computers compared to desktops between 2004 and 2009. In addition, it found that ICT was "ubiquitous" in the life of nearly all students, enabling them to access their academics rapidly and receive responses in a timely fashion via email and discussion forums (Smith, Salaway *et al.* 2009).

Five studies reported that if students believed ICT was useful and would improve their learning, they were more likely to use the E-learning technology (Appendix 2a,b,c). A study from Singapore (Kowitlawakul, Chan *et al.* 2015) found that if nurse academics perceived ICT as useful in health care, this influenced students' perception of ICT usefulness while undertaking clinical placement.

The previous results are also supported by Mitchell *et al*. (2007), who found that students who logged on early in the semester were more likely to receive higher grades than students who logged on later in the semester. While many students were satisfied with the change to the E-learning environment, this was not always the experience for many others.

2.3.3 Theme 3: Influences impacting students' ability to use E-learning

Nine studies identified that students were frustrated by lack of technical support and unpredictable internet access (see Table 2-6). Students experienced frustration at the amount of their time being wasted when computer applications did not work as expected. They also made it clear that they did not want to lose face-to-face contact with academic staff (Kelly, Lyng *et al.* 2009, Smyth, Houghton *et al.* 2012, Bloomfield & Jones 2013).

Students using their computers at home described how their computer screens froze when attempting to download learning resources because of slow internet connections (Creedy, Mitchell *et al.* 2007, Bloomfield, While *et al.* 2008, Safford & Stinton 2014). Slow internet connection also resulted in online connection drop outs (Kelly, Lyng *et al.* 2009 60). Students from eight studies described how they experienced frustration at not being able to problem solve ICT issues themselves and not having access to ICT technical support from the university when required (see Table 2-6).

Table 2-6 Influences impacting students' ability to use E-learning

Source	Lack of ICT technical support	Frustration with ICT problems	Internet access unpredictable	Keep face-to-face teaching
1. Bloomfield & Jones, 2013	✓	✓		✓
2. Creedy *et al*., 2007	✓	✓	✓	
3. Eley *et al.*, 2008	✓	✓		
4. Gonen *et al.*, 2016		✓	✓	
5. Kelly *et al*., 2009	✓	✓	✓	✓
6. Roby *et al*., 2013	✓			
7. Safford & Stinton, 2014	✓	✓	✓	
8. Smyth *et al*., 2012	✓	✓		✓
9. Verhoeven *et al*., 2014	✓	✓		
Total n=9	**n=8**	**n=8**	**n=4**	**n=3**

2.3.4 Theme 4: Influences impacting academics' ability to use E-learning

Many academics were trying to develop E-learning resources and implement these in their teaching but many obstructive influences impacted their ability to achieve this. Studies focusing on academics (n=20), and those focusing on academics and students (n=7), uncovered these influences. Eighteen of the 25 academic or academic and student focused studies found internal influences (feelings and attitudes perceived by the person) that impacted how academics used E-learning and associated ICT (see Table 2-7). Seventeen of the 25 studies reported where external influences impacted how academics used E-learning and associated ICT (see Table 2-9). Hence, two sub-themes were formed: sub-theme 4A, internal influences impacting academics' use of E-learning; and sub-theme 4B, external influences impacting academics' use of E-learning.

Sub-theme 4A, internal influences impacting academics' use of E-learning included:

- Perceived usefulness of E-learning
- Feelings of frustration when using ICT and E-learning
- Resistance to using E-learning.

Sub-theme 4B, external influences impacting academics' use of E-learning, included:

- Lack of effective professional development
- Lack of technical ICT support
- Lack of incentive to use E-learning
- Quality of LMS Functions content, speed, interaction capability
- Lack of time to learn integration and development of E-learning
- Lack of evidence of pedagogical success with E-learning.

2.3.4.1 Sub-theme 4A: Internal influences impacting academics' use of E-learning

The 17 studies where internal influences affecting academics' ability and willingness to use E-learning and associated ICT were examined are listed in Table 2-7, then discussed.

Table 2-7 Sub-theme 4A: Internal influences impacting on academics' ability to use E-learning

	Sources	**High perceived usefulness increases LMS use**	**Frustration with ICT and E-learning**	**Resistance or lack of motivation to use E-learning**
1	Blake (2009)	✓		
2	Cooper (2008)	✓		
3	Crews, Miller *et al.*2009		✓	
4	Fathema *et al.* (2015)	✓		
5	Gonen, Sharon *et al*. (2016)	✓		
6	Green (2011)			✓
7	Habib and Johannesen (2014)	✓		✓
8	Lloyd, Byrne *et al* (2012)		✓	✓
9	MacCallum, Jeffrey *et al.* (2014)	✓		
10	Moule, Ward *et al* (2011)		✓	✓
11	Petit dit Dariel, Wharrad *et al.* (2014)	✓	✓	✓
12	Regan, Evmenova *et al.*(2012)		✓	
13	Risquez and Moore (2013)	✓		✓
14	Roby, Ashe *et al.*(2013)	✓		
15	Smith, Passmore *et al.* (2009)		✓	
16	Taylor and Newton (2013)	✓		
17	Zelick (2013)			✓
	Total n=17	**n=10**	**n=6**	**n=7**

Perceived usefulness of E-learning

Ten studies reported academics who perceived E-learning and the LMS as useful, and who, as a consequence, were more likely to integrate E-learning into their current teaching.

Feelings of frustration when using ICT and E-learning

Six studies found academics were frustrated when using E-learning, citing lack of support from management and lack of available ICT technical support as the main reasons for their frustration. Management did not appreciate the extra time required for the development, implementation and evaluation of E-learning. Academics were left feeling frustrated because they were unable to implement E-learning effectively despite management indicating that E-learning needed to be implemented (Lloyd, Byrne *et al.* 2012, Regan, Evmenova *et al.* 2012, Petit-dit-Dariel, Wharrad *et al.* 2014).

Resistance to using E-learning

A further seven studies found that academics were either resistant to using E-learning due to lack of teaching experience (Cooper 2008, Lloyd, Byrne *et al.* 2012) or did not see E-learning as part of their pedagogy (Habib & Johannesen 2014, Petit-dit-Dariel, Wharrad *et al.* 2014); they did not see why they needed to integrate E-learning into their teaching methods. Two studies, Zelick (2013) and Risquez (2013), identified lack of professional reward and recognition as reasons for academics resisting the integration of E-learning into their teaching practices.

2.3.4.2 Sub-theme 4B: External influences impacting academics' use of E-learning

External influences that hindered how academics used or tried to incorporate E-learning and related ICT into their teaching and associated daily work were identified in the 18 studies listed in Table 2-8 (next page).

Lack of effective professional development

The lack of professional development was identified in 14 of the studies. Moule *et al*. (2011) reported that unless there was a systematic approach, including funding to provide professional development, the implementation of E-learning would stall. Taylor and Newton (2013), and Zelick (2013) reinforced these sentiments. The lack of professional development meant academics were not equipped with the skills they needed, and thus were reliant on variable levels of ICT technical support before, during and after they taught classes.

Lack of technical ICT support

The lack of ICT support was found in 11 studies. Green (2011) stated that university ICT services were required 24 hours a day, 7 days a week to support academics and students to effectively use E-learning as they worked and learned. However, at the time of the study, ICT support was available only during office hours – five days a week. This contributed greatly to staff and student frustration when using E-learning and its associated technology.

Lack of incentive to use E-learning

Lloyd *et al*. (2012) and Zelick (2013) found that institutional barriers and the lack of understanding by departmental leadership regarding the increased time online teaching takes (compared to face-to-face teaching) were prohibitive when academics considered incorporating E-learning into their teaching. Studies by Blake (2009) and Roby *et al.* (2013) suggested that academics should be financially rewarded by way of a stipend or paid overtime because of the amount of time required to develop and implement E-learning. They saw this as a strategy to incentivise E-learning integration.

Table 2-8 Sub-theme 4B: External influences impacting academics' use of E-learning

	Sources	Lack of effective professional development	Lack of technical ICT support	Lack of incentive to use E-learning	Quality of LMS Functions content, speed, interaction capability	Lack of time to learn integration and development of E-learning	Lack of evidence of pedagogical success with E-learning
1	Allan *et al.*, 2012	✓	✓				✓
2	Blake, 2009	✓	✓			✓	
3	Cooper, 2008			✓			✓
4	Crews *et al.*, 2009	✓	✓			✓	
5	Fathema *et al.* 2015	✓			✓		
6	Green, 2011	✓	✓	✓	✓		
7	Habib & Johannesen, 2014	✓	✓				
8	Jokinen & Mikkonen, 2013	✓					✓
9	Lloyd *et al.*, 2012	✓	✓	✓	✓	✓	✓
10	Moule *et al.*, 2011	✓	✓	✓		✓	
11	Nguyen *et al.*, 2011	✓	✓	✓			
12	Petit dit Dariel, Wharrad *et al.* (2012)						✓
13	Porter *et al.*, 2015		✓	✓			✓
14	Roby *et al.*, 2013	✓	✓	✓	✓	✓	
15	Smith *et al.*, 2009		✓		✓	✓	
16	Taylor & Newton, 2013	✓			✓		
17	Yu *et al.*, 2013	✓					
18	Zelick, 2013	✓					✓
	Total n=18	**n=14**	**n=11**	**n=7**	**n=6**	**n=6**	**n=7**

Quality of LMS Functions content, speed and interaction capability

The level of difficulty academics experienced when using facilities within the online LMS was seen as a barrier in six studies (Smith, Passmore *et al.* 2009, Green 2011, Lloyd, Byrne *et al.* 2012, Roby, Ashe *et al.* 2013, Taylor & Newton 2013, Fathema, Shannon *et al.* 2015). As a consequence of the lack of professional development and lack of ICT technical support already cited, academics were often left floundering when using a LMS that was not intuitive and required a level of ICT programming expertise (Roby, Ashe *et al.* 2013, Fathema, Shannon *et al.* 2015). Fathema *et al.* (2015) highlighted that an LMS must meet students' and academics' needs, and required adequate support in the form of technical help, internet infrastructure, hardware, software, training and online help to significantly influence its use by academics. The difficulties academics experienced using LMS diverted time from other activities.

Lack of time to learn integration and development of E-learning

Six studies found academics were concerned with the amount of time involved in developing and facilitating E-learning (Cooper 2008, Blake 2009, Crews, Miller *et al.* 2009, Smith, Passmore *et al.* 2009, Moule, Ward *et al.* 2010, Lloyd, Byrne *et al.* 2012). The issue of time and E-learning is multi-faceted. Academics found that interacting with students online sometimes took twice as much time as face-to-face traditional teaching (Blake 2009, Crews, Miller *et al.* 2009). In a USA study (Crews, Miller *et al.* 2009), time constraints were found to hinder the preparation of new lectures that integrated ICT. Inadequate training and support on behalf of the institution also hampered the time taken to learn new technologies. Chapman (2007) estimated that to develop one hour of instructor-led training took 43 production hours at a projected cost of $5,934 US. One online hour of content for basic E-learning, including content pages, text, graphics, simple video, test questions and the incorporation of PowerPoint™ visuals, requires 79 hours of program production at an estimated cost of $10,054 US. The reviewed studies indicated that the development of E-learning resources by staff was expected to occur without any additional funding or time allocation.

A mixed methods study of 35 higher education health science teaching staff in the UK (Moule, Ward *et al.* 2010) found that academics had very little time to undertake any E-learning development, and the majority of E-learning was in the form of instruction; it did not involve any student group collaboration. These findings are further supported by Smith *et al*. (2009), whose study identified additional concern about the lack of time available to staff to ensure the quality of online courses.

Lack of evidence of pedagogical success with E-learning

Seven studies (Cooper 2008, Allan, O'Driscoll *et al.* 2012, Lloyd, Byrne *et al.* 2012, Petit dit Dariel, Wharrad *et al.* 2012, Jokinen & Mikkonen 2013, Zelick 2013, Porter & Graham 2015) found that not all academics were convinced there was sufficient educational pedagogical evidence of the effectiveness professed to occur when students engaged with E-learning. Three of these (Cooper 2008, Jokinen & Mikkonen 2013, Porter & Graham 2015) found that academics did not want to give up their face-to-face classroom teaching and student contact. Instead, they wanted to integrate E-learning with their face-to-face teaching in a blended learning format. Petit dit Dariel, Wharrad *et al.* (2012) found that some nurse academics felt nursing, being a hands-on profession, could not be taught uisng E-learning. Allan *et al.* (2012) found that some academics wanted to be able to provide extra support to non-traditional learners when using E-learning. This category of leaners included students from geographical areas of low participation in higher education, commencing students aged over 21 years, students with disabilities and students from minority ethnic backgrounds.

2.4 Implications for E-learning in the future

Researchers from the reviewed studies where nursing education was the focus recommended that education providers incorporate CIL and NI skills into the undergraduate curriculum as a matter of urgency to meet the current work requirements of registered nurses (Cooper 2008, Crews, Miller *et al.* 2009, Nayda & Rankin 2009, Nguyen, Zierler *et al.* 2011).

The positive aspects of E-learning for students included increased learning flexibility, and rapid access and responses to their academics via electronic mail. Some students and academics, whilst acknowledging the benefits offered by E-learning, were more in favour of blended learning (where classroom and online learning were blended together), which they believed offered the best of both worlds.

Academics were concerned about accessing appropriate professional development surrounding E-learning, with a focus on online course development, assessment and monitoring the quality of online courses. One of the greatest concerns for academics was the amount of time E-learning took to develop, implement and teach. Recommendations from the reviewed studies included the need for recognition of the extra time E-learning takes by incorporating it into academics' workload.

2.4.1 Strengths and limitations of the studies

While each of the reviewed studies had weaknesses (for example none were conducted at levels of evidence I or II) and they all had different research approaches, similar conclusions were drawn. As noted previously, all the quantitative studies developed their own tools in response to the lack of appropriate current tools to measure CIL, information literacy, and E-learning outcomes and issues. Additionally, only 13 of the 33 quantitative instruments used in the reviewed studies discussed validation of the tools. A further limitation was that many of the studies were conducted in only one university (see Appendix 2a,b,c).

The exclusion of studies prior to 2006 was seen as strength due to the rapid changes that occur in ICT. The development of E-learning technology continues at a rapid pace, therefore studies prior to 2006 would not have been based on current technology and the findings might have been redundant.

2.5 Summary

Recent studies continue to report similar issues related to E-learning in university programs of study worldwide (MacCallum, Jeffrey *et al.* 2014, Li, Wang *et al.* 2015, Robertson & Felicilda-Reynaldo 2015, Gonen, Sharon *et al.* 2016). The lack of students' and academics' CIL skills prevent realisation of the full potential of E-learning. The reviewed studies found that internal and external drivers play an important role in students' and academics' ability to use E-learning and its associated ICT.

Perceived usefulness and ease of use were important internal drivers. External drivers included the level of support provided when using E-learning and it's associated ICT. Support for students included lessons in ICT and database searching, and 24 hours per day, seven days per week technical support when they were accessing LMS writing assignments.

External drivers for academics included having classrooms equipped with reliable multimedia equipment, and easy to use online interfaces for both students and academics to prevent time wastage setting up connections setup before facilitating learning. Another external driver for academics was university administration's lack of recognition of the time taken to develop, implement and teach in the E-learning environment.

Only eight of the 58 reviewed studies (Levett-Jones, Kenny *et al.* 2009, Nayda & Rankin 2009, Moule, Ward *et al.* 2010, Roby, Ashe *et al.* 2013, Taylor & Newton 2013, MacCallum, Jeffrey *et al.* 2014, Parkes, Stein *et al.* 2015, Gonen, Sharon *et al.* 2016) explored both students' and academics' issues together. Only one of these eight studies (Moule, Ward *et al.* 2010), which was based in the UK, collected data from more than one university. The review revealed a gap in the research literature; identifying the perspectives of how E-learning and the associated technology impacts on both nursing students and academics involved in undergraduate nursing programs in the Australian context. Computer information literacy has become an essential lifelong learning skill for registered nurses alongside the skills involved in making clinical judgements about client care.

The findings highlight that issues relating to how E-learning influences and affects students and academics are similar across the world. They also confirm an urgent need to develop robust quantitative instruments to measure students' and academics' perceptions about using E-learning and its associated ICT. Once developed, such instruments may provide reliable data that can be used to develop contemporary undergraduate nursing curricula to meet the ICT needs of the changing health care setting.

The next chapter discusses the philosophical assumptions that guided the methodological framework used in this mixed methods study.

Chapter 3 Methodology

3.1 Introduction

The literature reviewed in the previous chapter highlighted the many internal and external influences that affect how students and academics interact with current electronic technologies to achieve learning. These influences include the psychological (internal) and physical (external) drivers that impact on students' and academics' ability to learn.

Denzin (2011) argues that the methodology should focus on the best means for acquiring knowledge about the world. In this study, the world consisted of students' and academics' environment and lives as they encountered electronic technologies as part of their higher education involvement.

The purpose of this chapter is to present the philosophical framework that guided the research strategy. It describes the eight step research design, which was underpinned by the importance of demonstrating how data is integrated to provide a new set of data in a mixed methods study.

As stated in Chapter 1, the research aimed to explore and identify students' and academics' experiences of, and perspectives about, current issues relating to E-learning and its associated information computer technologies (ICTs), and their use in nursing education in Australian university undergraduate nursing programs. Based on the literature review findings from the previous chapter–that despite E-learning technologies being used for over 30 years, students and teachers in all education areas were still experiencing problems working with E-learning and associated technology–a study such as this is needed to explore more fully whether technologically enhanced learning is of benefit to nursing education.

3.2 Research paradigm

The following discussion explores the beliefs and principal assumptions found within the interpretive (also called constructivist/naturalistic qualitative) paradigm as well as the empirico-analytical (also known as positivist quantitative) paradigm. This discussion was seen as essential for demonstrating the relevance of the chosen design for the study (mixed methods).

3.2.1 Researching in the interpretive/constructivist paradigm

Qualitative research involving naturalistic inquiry is located within the interpretive/constructivist paradigm (Guba & Lincoln 2005). Research within this paradigm aims to address questions concerned with developing an understanding of the meaning and experience dimensions of humans' lives and social worlds. Constructivism is a theory of knowledge (epistemology) that argues that humans generate knowledge and meaning from an interaction between their experiences and their ideas (Ponterotto 2005). Further, there is an appreciation of how the social world is experienced, and how the person interprets reality and existence (ontology) (Holloway & Wheeler 2013).

Interpretive research views a phenomenon as a whole and makes inquiries about that phenomenon to uncover meanings and significant understandings of participants involved with it (Denzin & Lincoln 2011). Interpretive research provides a more in-depth understanding of the social and community dynamics evolving with the participants (Creswell 2009). The researcher takes into the inquiry their own pre-understandings about how their position impacts on the phenomenon and the participants. Therefore, the researcher declares their beliefs (epistemology) at the commencement of any study, explicitly stating knowledge of the phenomenon and outlining their relationship with the participants. This declaration identifies any researcher bias that may influence their interpretation of the data and trustworthiness of the findings (Kuper, Reeves *et al.* 2008).

3.2.2 Researching in the empirico-analytical/positivist paradigm

The empirico-analytical/positivist paradigm includes research undertaken using the “scientific method”. Thinking within this approach focuses on “objectivity”, emphasising the rational and the scientific (Denzin & Lincoln 2011). Unlike the naturalistic paradigm, the positivist paradigm requires the researcher to stand at a distance to the inquiry and suspend his/her beliefs so they do not influence the study’s outcomes (Holloway & Wheeler 2013).

In positivist-based research, evidence is obtained via deductive reasoning processes to verify theories; the emphasis is on discrete and specific concepts. Such a position is related to the belief that reality exists and the real world is driven by real natural causes and ensuing effects, which can be measured and controlled (Denzin & Lincoln 2011).

Today, strict positivist thinking has been challenged. More commonly, the post-positivist beliefs that recognise the impossibility of total objectivity are acknowledged. These beliefs are now used predominantly in nursing research (Holloway & Wheeler 2013). Post-positivist thinking, while acknowledging the impediments to knowing reality with absolute certainty, seeks out probabilistic evidence. Recognition of multiple ways of knowing and experiencing the world has led to another paradigm emerging; the mixed methods approach, which prevents qualitative and quantitative approaches being set against each other and instead provides a “bridge” where the strengths of one approach support the weaknesses of the other.

3.3 Pragmatism underpinning the mixed methods approach used in this study

It is acknowledged that the interpretive and post-positivist paradigms both offer potential research approaches (Johnson & Onwuegbuzie 2004). However, the decision to use the mixed methods approach for this study was based on another emerging philosophy; “pragmatism” (Mounce 2000, Biesta 2010, Feilzer 2010). Pragmatism is discussed prior to discussing the study’s mixed methods approach (see section 3.4).

Pragmatism, an American-founded philosophy initiated by Charles Sanders Peirce (1839-1914), was primarily a philosophy of meaning underpinned by his logician, mathematical and scientific view of the world. The popularity of pragmatism evolved from the early 20th century through the efforts of William James (1842-1910) and John Dewey (1859-1952) (De Waal 2005), and has continued to develop. James saw that his form of pragmatic thinking offered a solution to resolving metaphysical disputes. He proposed that these philosophical disputes were based on a clash between differing human temperaments. James saw people who espoused empirical worldviews as being “tough minded” and factual thinkers, while other people with “tender minds” tended to follow idealistic, optimistic and religious ways of thinking (Murphy 1990, Ormerod 2006). Dewey continued to develop pragmatism and its application to everyday issues such as politics and education. Like Peirce, Dewey perceived inquiry as a self-correcting process that is revised continually as a result of further experiences. Dewey viewed knowledge as an instrument a person used for undertaking an action rather than as an object that needed to be believed (Ormerod 2006).

Firstly, Dewey brought pragmatism to maturity by focusing on the pragmatic method of inquiry as an ever-ongoing, self-correcting and social process. Dewey‘s first belief was that the scientific method was a paradigm of controlled and reflective inquiry. In various works, Dewey referred to his version of pragmatism as "instrumentalism" and "experimentalism." He combined Peirce's community-sense of inquiry with the affective elements of James' work (Biesta 2010).

Secondly, Dewey believed that the philosophical view should be from the bottom up as opposed to the commonly held view of a top down approach. Dewey’s view avoided prejudicial frameworks and assumptions by arguing that one should accept experience as it is lived (Hildebrand 2008). This approach is self-consciously empirical (based on evidence from past experiences), fallible (current beliefs and research conclusions are rarely, if ever, viewed as perfect, certain or absolute) and social (occurring in the everyday world). Employing pragmatism can “open the eyes and ears of the mind… to all the varied phases of life and history” (Dewey 1984 / LW 4 [1929] p. 373).

Dewey’s third guiding belief was that philosophical questions about knowledge and truth can never be completely separated from efforts to create and preserve value. Dewey possessed a melioristic view of the world in which this life is neither perfectly good nor bad, and can be improved only through human effort. Dewey saw knowledge and truth as a working hypothesis drawn from experience. If a researcher is to accept the challenge implied by the melioristic hypothesis (the world will become a better place through human work), then the researcher needs to admit that the proper purpose of intellectual inquiry is to search for ways (ideas, practices) to improve this life instead of looking for absolute value or reality per se (Dewey 1917). If philosophy is to be relevant and amount to more than intellectual recreation, it must engage with the problems of the everyday person. Philosophical thinking and knowledge generation for Dewey started from the lived experience (practically) and was motivated by moral ends (meliorism) (Dewey 1917, Greene & Caracelli 2003, Hildebrand 2008).

Dewey and other classical pragmatists such as James contributed to the achievement of pragmatism as an important research belief that is still valued today (Cochran-Smith, Feiman-Nemser *et al.* 2008, Wereley, Schmidt *et al.* 2008, Biesta 2010, Garrison, Neubert *et al.* 2012). Despite the wane in pragmatism during World War II, pragmatists including Hilary Putnam and Richard Rorty revived, improved and popularised it in the 1980s (Talisse & Aikin 2008).

3.3.1 Pragmatism's ontological beliefs

The Deweyan outlook acknowledges the pragmatic ontological assumptions that are held about what constitutes social reality. Instead of ontological assumption being a debate over the true structures of social reality, ontology sees reality as the result of social life; the intertwined social, cultural and political interactions and activities of people within some community or another (Mounce 2000, Biesta 2010, Feilzer 2010).

Dewey explained that all information is acquired and applied in transactions with the environment, and all knowledge is conditioned by the inquirer's problem setting and purposes, based ultimately on a particular human point of view (Kivinen & Piiroinen 2004). Dewey clarified reality for a person with his explanation that "some pre-existent association of human beings is prior to every particular human being who is born into the world", but also understood that these associations were simply institutionalised customs–"modes of interaction of persons with one another" (Dewey 1983 / MW 14 [1922] *p.* 44).

3.3.2 Pragmatism's epistemological beliefs

Knowledge creation from a Deweyan pragmatic viewpoint is an enriching ongoing search for meaning by the person living in the world. Every situation a person navigates during their life results in them gaining knowledge (lessons learnt). Pragmatism sees knowledge creation from experiences that are pluralistic (encompassing many viewpoints), experimental (involved in trial and error learning), fallibilist (acknowledging that it is impossible to attain absolute knowledge) and naturalistic (resulting from the physical laws and forces that operate in the world) (Garrison 1995, Kivinen & Piiroinen 2004, Boyles 2006).

As described in Chapter 1, John Dewey's adoption of pragmatism has had a wide reaching impact on the development of pedagogical thinking. In line with Dewey's pragmatic worldview, the learner is seen as an active participant where learning is achieved through experience and reflection. Dewey's contribution to educational development falls into four main areas:

- Belief that education must engage with, and enlarge, the student's experience
- Exploration of thinking and reflection–and the associated role of academics
- Interaction and environments for learning to provide a continuing framework for practice
- Democracy, for educating so that all may share in a common life learning experience. (Dewey 1938)

Dewey saw the aim of education as personal growth (learning) through the cyclic reconstruction of the experiences they have as their teacher offers them structured encounters and activities (Garrison, Neubert *et al.* 2012). In the current study, Dewey's view of the world was used as the base for the mixed methods research design.

3.3.3 Pragmatism and mixed methods

Pragmatism as a worldview allows the researcher to be free of mental and practical constraints imposed by the need to choose between two dominant paradigms. The pragmatic view does not require a particular method or methods mix, and does not exclude other methods (Feilzer 2010). Pragmatism supports mixed methods research because it does not expect to find unvarying causal links or truths. Instead, pragmatism aims to interrogate a particular question, theory or phenomenon with the most appropriate research methods (Biesta 2010, Dousa 2011).

Philosophical assumptions of pragmatism guided the direction of the data collection and analysis, and the mixing of qualitative and quantitative approaches during phases of the research process (Johnson, Onwuegbuzie *et al.* 2007). Figure 3-1 (next page), adapted from Creswell (2010), is a modified diagrammatical representation of the components of mixed methods research.

This figure has been removed due to copyright restrictions

Creswell, J. W. (2010). Mapping the Developing Landscape of Mixed Methods Research. Handbook of mixed methods in social and behavioral research A. Tashakkori and C. Teddlie. Thousand Oaks, Sage Publications Inc: 45 - 68.

Figure 3-1 Diagram of mixed methods research components (adapted from Creswell 2010)

3.3.4 The researcher's adoption of Deweyan pragmatism for mixed methods

The researcher's long career as both a clinician and academic resulted in a close alignment of her worldview with Dewey's pragmatism and educational philosophy. This nurse researcher endorsed Dewey's way of being and moving through the world. Finding a strong alliance with the general characteristics of pragmatism, particularly its concern more with how best to answer the specific research question than adhering to the inquiry methods used in only one paradigm (Mertens 2005), influenced the adoption of pragmatism as the overall philosophical framework for the study. Further, Dewey's beliefs about how people learn and create knowledge resonated with her.

3.4 Mixed methods research: An overview

The area of mixed methods research has seen an almost exponential growth of research designs over the last few decades (Leech & Onwuegbuzie 2009) to the point where it has emerged as a third research paradigm (Johnson & Onwuegbuzie 2004, Leech & Onwuegbuzie 2009, Onwuegbuzie, Dickinson *et al.* 2009, Creswell 2010, Onwuegbuzie & Combs 2010, Tashakkori & Teddlie 2010). While mixed methods research has increased in popularity in many disciplines, including those listed below, it is acknowledged as still being in its adolescence:

- Education (Biesta & Burbles 2003, Rocco, Bliss *et al.* 2003, Johnson & Onwuegbuzie 2004, Niaz 2008, Biesta 2010)
- Nursing (Twinn 1998, Sandelowski 2001, Grant & Giddings 2006, Sandelowski, Voils *et al.* 2006, Andrew & Halcomb 2007, Andrew & Halcomb 2009, Halcomb & Andrew 2009, Halcomb & Andrew 2009, Morse 2009, Morse 2010, Morse 2010a)
- Sociology (Hunter & Brewer 2003, Maxcy 2003, Woolley 2009)

- Health sciences (Forthofer 2003, O'Cathain, Murphy *et al.* 2008, Scott & Briggs 2009)
- Management and organisational research (Currall & Towler 2003)
- Library and information science research (Onwuegbuzie, Jiao *et al.* 2004)
- Program evaluation (Greene, Caracelli *et al.* 1989, Rallis & Rossman 2003, Greene 2008).

O'Cathain (2009, *p.* 3) has called the increase in the frequency of use of mixed methods research, particularly in health sciences, “a quiet revolution”. As recently as a decade ago there was little guidance for nurse researchers undertaking mixed methods research studies (Polit & Beck 2012), but today philosophical debates and the manner in which mixed methods research is applied continues to evolve (Johnstone 2004, Giddings 2006, Gilbert 2006, Grant & Giddings 2006, Sandelowski, Voils *et al.* 2006, Lipscomb 2008, Andrew & Halcomb 2009, Giddings & Grant 2009, Morse 2009).

Most of the criticisms about using a mixed methods research design have been based on the belief that both empirico-analytical (post-positive) and interpretive paradigms cannot be integrated into a single study because of their different ontological and epistemological stances. This viewpoint emanated from the era of thinkers such as Guba (1987), who clearly identified the extent of the dichotomy between the paradigms by stating how “the one precludes the other just as surely as belief in a round world precludes belief in a flat one” (Guba 1987, *p.* 31).

Other scholars disagree with Guba's conclusion. They argue against the issue of incompatibility and recommend that researchers maintain the pragmatic stance and focus on “what works” (Johnson & Onwuegbuzie 2004, Creswell 2009, Tashakkori & Teddlie 2010). Table 3-1 summarises the strengths and limitations of mixed methods research.

Mixed methods research makes use of the pragmatic method and system of philosophy. Its logic of inquiry includes the use of induction (discovery of patterns), deduction (testing of theories and hypotheses) and abduction (uncovering and relying on the best of a set of explanations for understanding one's results) (Johnson & Onwuegbuzie 2004).

Mixed methods research also legitimises the use of multiple approaches in answering research questions, rather than restricting or constraining researchers' choices (i.e., it rejects being rigid). It is an expansive and creative form of research–inclusive, pluralistic and complementary–and it suggests that researchers take an eclectic approach to method selection, and thinking about, and conducting, their research (Creswell 2009, Tashakkori & Teddlie 2010).

Table 3-1 Strengths and limitations of mixed methods research

This table was deleted due to copyright restriction

Johnson, R. B. & Onwuegbuzie, A. J. (2004). "Mixed Methods Research: A Research Paradigm Whose Time Has Come." Educational Researcher **33**(7): 14-26. p 21

DOI: 10.3102/0013189x033007014

http://journals.sagepub.com/doi/abs/10.3102/0013189X033007014

Accessed 28 /11/17

Johnson *et al*.'s (2007) definition of mixed methods research was adopted during the current research study:

> Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration. (Johnson, Onwuegbuzie *et al.* 2007, *p.* 123)

It is argued that researchers have used this methodology to expand the scope and improve the analytic power of their study (Sandelowski 2000, Giddings & Grant 2009). Recognising that all methods have limitations, researchers Cherryholmes (1992) and Creswell (2009) believed that biases inherent in any single method can neutralise or cancel out the biases in other methods. This researcher does not support this notion unequivocally but contends that using mixed methods research in her study enabled her to present different slices of reality, thus allowing the emergence of a more comprehensive understanding of E-learning and undergraduate nursing education for students and academics.

Further justification for using mixed methods research to guide this investigation comes from Halcomb and Andrew (2005), who argued that combining research methods was necessary for the development of nursing knowledge due to the complex nature of the type of phenomena nurses investigate. Chatterji (2005) gives this argument additional support. She contends that research in education needs to consider community settings as well as the contextual influences that impact the learning environment and education providers.

The final argument to support the selection of mixed methods research in this investigation into E-learning in nursing comes from the area of electronic information resources in libraries. Dalton and McNicoi's (2004) use of mixed methods research in evaluating electronic library resources provided a deeper understanding than revealed by predominantly quantitative in that area. Niaz's statement that mixed methods research "provides a rationale for hypotheses/ theories/ guiding assumptions / presuppositions to compete and provide alternatives" (Niaz 2008, *p.* 298) encapsulates the current researcher's decision to use mixed methods research.

3.4.1 Decision-making in mixed methods research

When undertaking a mixed methods approach, a researcher needs to make a number of decisions. Andrew (2009) and Creswell (2013) contend that there is a need to consider:

A. Purpose (or reason) for using mixed methods rather than choosing either a qualitative or quantitative approach alone.

B. The research typology (or the process) of mixed methods design needs to be clarified, including the reason for the choice made.

C. Priority decision whether the preliminary study uses qualitative or quantitative methods and the size of that study.

A. The purpose for using mixed methods research

There may be more than one purpose for conducting a study using mixed methods (Tashakkori & Teddlie 2010). An appraisal of the literature revealed a number of agreed purposes for using a mixed methods research approach. For example, Greene, Caracelli *et al*. (1989), Johnson and Onwuegbuzie (2004), and Andrew and Halcomb (2007) all agree that there are six purposes. Table 3-2 highlights these six purposes (reasons) along with some common rationales for conducting mixed methods research. Complementarity was the reason (highlighted in grey) for using mixed methods in this study.

Table 3-2 Purposes of mixed methods research

Purposes of mixed methods research	Purpose	Rationale
1.	**Complementarity** seeks elaboration, enhancement, illustration and clarification of the results from one method with the results from the other	To increase the interpretability, meaningfulness and validity of constructs and inquiry results by both capitalising on inherent method strengths and counteracting inherent biases in methods and other sources.
2.	**Triangulation** seeks convergence, corroboration and correspondence of results	To increase the validity of constructs and inquiry results by counteracting or maximising the heterogeneity of irrelevant sources of variance attributable especially to inherent method bias but also to inquirer bias, bias of substantive theory and biases of inquiry context
3.	**Development** seeks to use the results from one method to help develop or inform the other method, where development is broadly construed to include sampling and implementation as well as measurement decisions	To increase the validity of constructs and inquiry results by capitalising on inherent method strengths
4.	**Initiation** seeks the discovery of paradox and contradiction, new perspectives of frameworks, and the recasting of questions or results from one method with questions or results from the other method	To increase the breadth and depth of inquiry results and interpretations by analysing them from the different perspectives of different methods and paradigms.
5.	**Expansion** seeks to extend the breadth and range of inquiry by using different methods for different inquiry components	To increase the scope of inquiry by selecting the methods most appropriate for multiple inquiry components
6.	**Enhance significant findings** seeks to augment findings from one method of data collection by specifically exploring another data collection method	To increase the strength of significant findings about the issues being studied

Source: Adapted from Greene, Caracelli *et al.* (1989), Johnson & Onwuegbuzie (2004) and Andrew & Halcomb (2007)

1. Complementarity

Complementarity was the reason for using mixed methods in this study. Complementarity was chosen to enhance and clarify the qualitative and quantitative results (Sandelowski, Voils *et al.* 2009), and to provide completeness (Bryman 2007). In an exploratory investigation such as this study, complementarity allows for comparison across the research paradigms to increase the meaningfulness of the findings (Greene, Caracelli *et al.* 1989, Morgan 1998).

2. Triangulation

Triangulation was not the reason for using mixed methods because the researcher had not identified constructs or a theory in E-learning that required the application of triangulation for validation. In this study, the Phase 1 qualitative findings were used to complement and assist in explaining the Phase 2 quantitative data (Halcomb & Andrew 2005).

3. Development

The primary purpose of this study was not the development of questionnaires to answer the research question. The study was exploratory in nature; it did not seek to validate already known constructs of how students and academics access and use E-learning (Andrew & Halcomb 2007). While data from Phase 1 of the study was used to develop the two instruments used in Phase 2 (questionnaires), this was a secondary purpose.

4. Initiation

As stated already, this study was exploratory in nature to discover the issues for students and academics of using E-learning. Its purpose was not to test an already known framework to initiate, or build on, already known results (Greene, Caracelli *et al.* 1989).

5. Expansion and 6. Enhance significant findings

The focus of the current explorative study was to extend the breadth and range of the inquiry by using two methods of inquiry (Paton 1990, Morse 2010). Extending the breadth and range would be reasons for using mixed methods research when the researcher was seeking expansion, and to add significance and validity to the results of a quantitative study (Greene, Caracelli *et al.* 1989, Morgan 1998).

After deciding the reasons for using mixed methods, the researcher considered the type and sequencing of the research design.

B. Research design typologies (how the research was conducted)

Creswell and Plano Clark (2011) offer four main “typologies” or research processes to guide mixed methods research:

- Embedded (or nested)
- Explanatory
- Exploratory
- Triangulation.

Embedded design

Embedded mixed methods design is used when a researcher requires a supportive, secondary stream of inquiry to the primary (main) data set (Creswell & Plano Clark 2011). The decision to use an embedded design is made following analysis of preliminary data, for example after the data has been collected and analysed in a large quantitative study. This type of design may be needed if the single data set is viewed as insufficient to answer the research question, in which case the researcher would locate groups from within (embedded) the original sample to become the participants in a qualitative study (Teddlie & Yu 2007, Creswell & Plano Clark 2011). Embedded design was not selected in this study because the Phase 1 qualitative data was required to facilitate the development of the two quantitative questionnaires; it was not seen as an adjunct to the quantitative phase (Punch & Oancea 2014).

Explanatory design

In explanatory design, initial quantitative results are explained by an additional qualitative aspect of a study (Creswell & Plano Clark 2007). Morse (2013) indicates that this design can be used in a study where the researcher needs qualitative data to explain significant, non-significant or unexpected results arising from the quantitative study. In this mixed methods study, the researcher was unsure of what issues surrounded E-learning for undergraduate nursing students or nurse academics. Therefore, the explanatory model was not selected.

Exploratory design

Similar to explanatory design, the intent of the two phase exploratory design is that the results of the first method (qualitative) can help develop and/or inform the second method (quantitative) (Greene 2008). This type of mixed methods design is selected when the variables surrounding the research question are unclear, or when the instrument required for measurement to answer the research question does not exist. Morse (2013) suggests that this type of mixed methods research design is of value when the researcher wants to generalize the research results to different groups. If there is no current guiding theory or framework, exploratory design is to be considered (Creswell & Plano Clark 2007).

In this study, the literature review did not reveal any Australian qualitative research involving nursing students and academics, and no valid instruments relevant to the study were located. In this two phase design, Phase 1 was the qualitative aspect in which methods such as focus groups were used to explore the research question to allow the researcher to identify themes for use in the quantitative Phase 2.

Triangulation design

Mertens and Hesse-Biber (2012) described triangulation as a technique often used by surveyors to locate an object in space by relying on two known points in order to ‘‘triangulate’’ on an unknown fixed point in that same space. Triangulation can be used in a variety of ways in mixed methods research, either in the design stage or the data integration stage when the researcher wants to directly compare and contrast findings from each phase. This has been discussed extensively in the literature (Jick 1979, Greene, Caracelli *et al.* 1989, Smith 1997, Mertens & Hesse-Biber 2012). In the current study, the researcher used the process of triangulation during data integration, which involved bringing together the data from the two phases to form a new data set (Fielding 2012, Fetters, Curry *et al.* 2013).

After making a decision about the type of design to be used, the researcher needed to decide which phase of the study would take priority. She selected a sequential exploratory design in which both phases of the study provided different and complementary data on the same topic.

C. Exploratory design priority sequencing

This study used the priority of QUANTITATIVE design over qualitative design in that the qualitative results formed the basis of a larger study undertaken with a quantitative questionnaire. The researcher has highlighted the priority sequencing of QUANTITATIVE data with capital letters (i.e., qual-QUANT). This expression identifies the priority one has over the other. The Phase 1 qualitative part of the study was smaller than the Phase 2 QUANTITATIVE part. The interpretive Phase 1 provided valuable data on key issues that the researcher was able to incorporate into Phase 2 of the study that otherwise would have remained unknown (Teddlie & Yu 2007, Creswell & Plano Clark 2011). Table 3-3 illustrates the priority sequencing decisions that were required when developing the eight step sequential Exploratory design for this study.

Table 3-3 The eight step exploratory mixed methods research design

This table has been removed due to copyright restriction

Creswell, J. W. & Plano Clark, V. L. (2007). Designing and conducting mixed methods research. California Sage Publications Ltd. p.76

3.5 The eight step mixed methods research design used in this study

In applying the eight step model to the current study, the researcher used an exploratory qualitative approach followed by a quantitative approach to answer the question: “What are the issues in E-learning for undergraduate nursing students and academics in Australia?”. She developed the following diagram to illustrate this sequential mixed methods design (see Figure 3-2, next page).

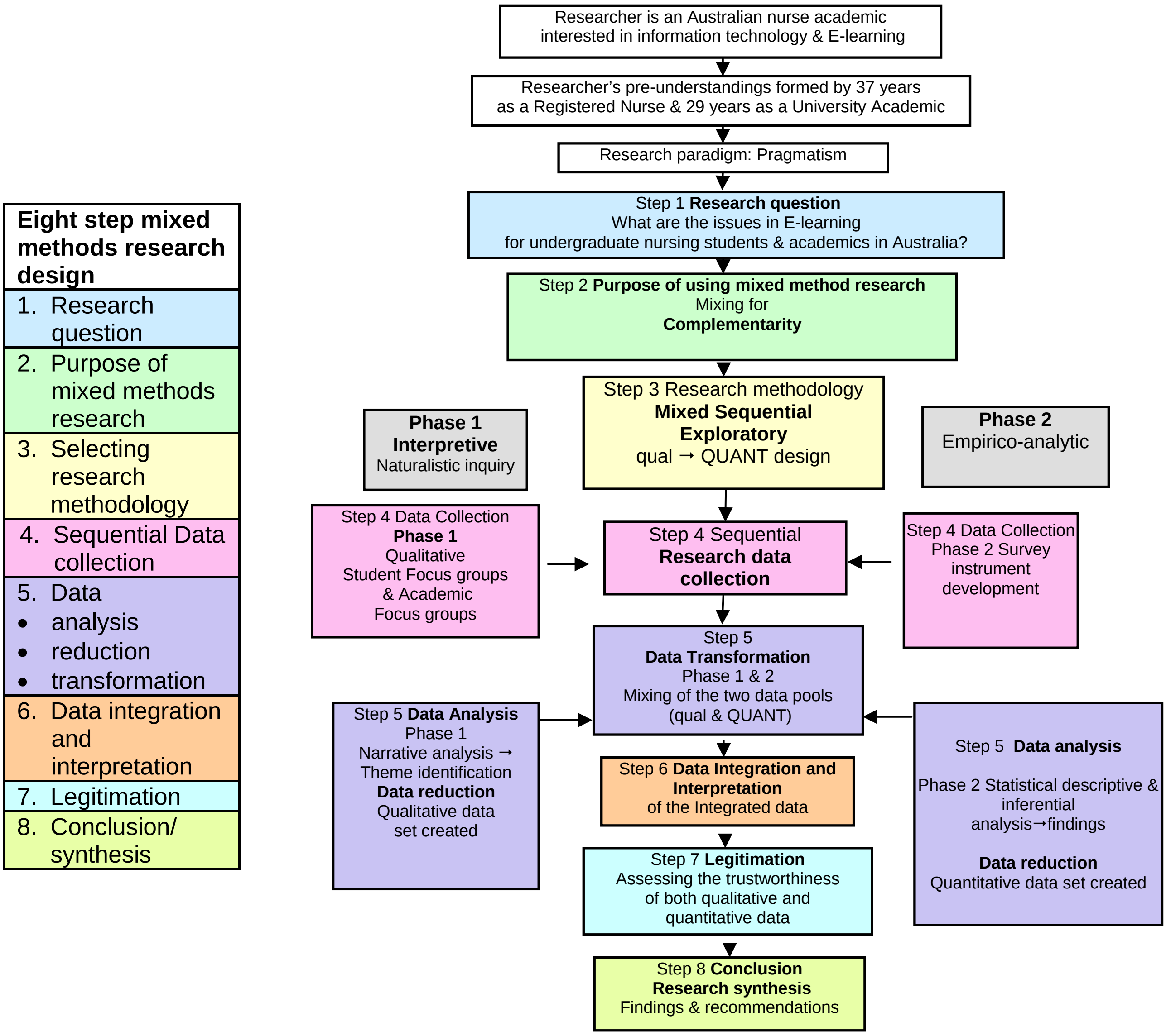

Figure 3-2 Eight step mixed methods research design

Following the development of the mixed methods study design, it was vital for the researcher to decide how to integrate the Phase 1 and Phase 2 data sets.

3.6 The importance of data integration

The integration phase is the essential aspect of mixed methods research. It is a unique characteristic that distinguishes mixed methods research from other research methodologies (Kroll & Neri 2009).The data integration process enhances the value of mixed methods research and so is seen as an important component of this study (Fetters, Curry *et al.* 2013). Selecting a philosophical framework such as pragmatism allowed for different data components to be integrated at any stage of the inquiry (Andrew & Halcomb 2009).

In this study, integration of the findings from both the interpretive and empirico-analytical phases was conducted in the final phase to further elaborate the overall findings (Morgan 1998). The researcher believed that a new data set would ensure portrayal of both the richness of the qualitative narrative data and the extensiveness of the quantitative data.

The integration of the data from the two phases achieved the aim of using mixed methods research; to produce a new understanding that would not have been possible if only qualitative or quantitative data collection methods were used (Creswell & Plano Clark 2007). One advantage of integrating the data sets after completion of all data collection is that integration allows the researcher to complement the study using different sources of evidence, and using the interpretive findings to expand or explain the findings from the empirico-analytical phase (2013). Green (2008) argued for three components of integration, which were all used in this study and are summarised in Table 3-4:

A. Data transformation

B. Data comparison

C. Formation of inferences.

A. Data integration by transformation

Data transformation occurs where qualitative data is coded into numerical data or where quantitative data is translated into text (Louis 1982, Tashakkori & Teddlie 2010). In this study, the Phase 1 descriptive themes were integrated with the Phase 2 statistically identified factors and the content analysis data resulting from the two open response questions in the two questionnaires. This strategy was achieved by a single researcher and the richness of the narrative text from the Phase 1 focus groups was not lost through transformation into numbers only (Sandelowski 2001).

B. Data integration by comparison

In data comparison, following analysis of the separate data the researcher looks for patterns within and across the data sets (Li, Marquart *et al.* 2000, Lee & Greene 2007). In this study, the researcher integrated the data sets using data comparison by an iterative process of moving between the two sets while comparing and contrasting results from the students' data and the academics' data.

C. Data integration by the formation of inferences

The final integration strategy involves major analyses for the formation of inferences and conclusions (Marquart 1990, Smith 1997, McConney, Rudd *et al.* 2002). In the current study, the formation of inferences occurred after the researcher had thoroughly examined the Phase 1 and Phase 2 data.

See Table 3-4 for a summary and rationale for the use of these three integrative strategies.

Table 3-4 Integrated mixed methods research analysis strategies

This table has been removed due to copyright restriction

Greene, J. C. (2008). "Is Mixed Methods Social Inquiry a Distinctive Methodology?" Journal of Mixed Methods Research **2**(1): 7-22.

DOI 10.1177/1558689807309969

http://journals.sagepub.com/doi/abs/10.1177/1558689807309969 accessed 28/11/17

Note: Mixed methods analysis strategies take place after data has been cleaned and analysed descriptively. References cited characteristically refer to an example of the noted strategy (Greene 2008, *p.* 15)

3.7 Summary

This chapter has presented the philosophical framework that guided this study. The chosen paradigm of pragmatism has been explored, including its ontological and epistemological beliefs. John Dewey's pragmatic beliefs about knowledge and learning have been outlined, as have the researcher's reasons for choosing Dewey's pragmatic view to guide the study.

Mixed methods research design has been discussed in depth, including the researcher's rationale for deciding to use it. The chapter has explained how the researcher's decisions enabled the development of the study's eight step sequential qualitative then quantitative mixed methods design.

Having completed the methodological discussion that supports the eight step mixed methods design used in this study, the researcher next discusses the research methods used in Phase 1 (qualitative) and Phase 2 (quantitative).

Chapter 4 Research Methods

4.1 Introduction

The preceding chapter explained the rationale for selecting a mixed methods research design and introduced the two phases of the study. This chapter is written in two parts. Part A describes the qualitative methods used in Phase 1 to reveal participants' experiences and perceptions through the researcher's interpretation of the research participants' subjective meanings (Silverman 2011). Phase 1 occurred in the naturalistic paradigm. Part B describes the quantitative methods used in Phase 2.

Part A includes a description of the ethical considerations when recruiting the student and academic participants, and the conduct of the focus groups, including management of verbatim transcripts.

Part B describes the methods used in implementing two questionnaires to collect data from nursing students and nurse academics in 19 universities across Australia, and analysing the data (including managing missing data). It also discusses integration of the qualitative and quantitative data throughout the two phases of the study.

PART A: PHASE 1, QUALITATIVE RESEARCH METHODS

4.2 Participant sampling

The unique aspect of Phase 1 of this study was the simultaneous collection of information from undergraduate nursing students and academics who were predominantly involved with teaching undergraduate nursing programs within the same tertiary school of Nursing and Midwifery. Simultaneous collection of data was important so both students and academics were using the same types of E-learning and ICT software and hardware.

4.2.1 Participant selection

Following ethical approval for the study (see Appendix 4), the researcher purposively sampled participants from one school of Nursing and Midwifery located in Adelaide with permission from the Dean. Only students and academics who met the study's participant inclusion criteria (see Table 4-1) were eligible.

Table 4-1 Inclusion and exclusion criteria

Students	
Inclusion criteria	**Exclusion criteria**
Enrolled in a program of study leading to registration as a nurse or midwife with the Nursing & Midwifery Board of Australia.	Postgraduate students Students enrolled in programs not leading to registration as a nurse or midwife with the Nursing & Midwifery Board of Australia.
Academics	
Inclusion criteria	**Exclusion criteria**
Full and part time academics teaching predominantly in programs of study leading to registration as a nurse or midwife with the Nursing & Midwifery Board of Australia	Full and part time academics teaching predominantly in postgraduate programs of study. Academics within the school of Nursing & Midwifery whose role does not include teaching predominantly in programs of study leading to registration as a nurse or midwife with the Nursing & Midwifery Board of Australia e.g. full time reseachers

4.3 Ethical issues, planning and consent

Prior to any focus groups being held, participants were given information about the research and the expectations of being involved in a focus group (Carey & Asbury 2012). They were informed about the research ethical approval and that their consent was required to participate in the group discussions. The issue of confidentiality was also addressed with the participants.

Tolich (2009) discussed two forms of confidentiality required when collecting data during focus groups; external and internal confidentiality. In meeting the need for external confidentiality, the researcher provided both written and verbal assurance to the participants that she would not disclose their identity; nor would any links be made between their identity and what they said during the focus group discussion (Beauchamp & Childress 2001).

Internal confidentiality alludes to a situation where a participant shares more information than they wanted to in a focus group and cannot take the information back (Tolich 2009). The researcher made participants aware that this may occur, and that the moderator would redirect the conversation if it was felt the participant may be compromised. The researcher also made participants aware of their obligation to respect other focus group participants' privacy by not disclosing any personal information shared during the discussion. Tolich (2009) pointed out that the researcher has no control over internal confidentiality; the skill of the moderator to redirect the discussion is imperative for participants' welfare in such situations.

All participants signed consent forms to verify their involvement and permit audio recording of the focus group discussions as well as the collection of field notes. Providing the opportunity for debriefing was also essential to ensure the participants' welfare but although this was offered to all participants during the study, it was not required.

4.4 Focus groups

Ten focus groups (five with the undergraduate students and five with the academics) were held between January and March 2010 involved a total of 27 students and 25 academics, as detailed in Table 4-2.

Table 4-2 Student and academic focus groups

Student focus groups	
Group 1	4 participants
Group 2	5 participants (2 identified as ESL)
Group 3	5 participants
Group 4	9 participants (5 identified as ESL)
Group 5	4 participants (1 identified as ESL)
Total student participants	**27 participants**
Academic focus groups	
Group 1	5 participants
Group 2	6 participants
Group 3	5 participants
Group 4	6 participants
Group 5	3 participants
Total academic participants	**25 participants**

4.4.1 Development of focus group guideline questions

The use of guideline questions (Table 4-3) provided the researcher with a degree of structure for the format of each group and assisted her in ensuring aspects important for the study would not be missed when the discussion diverged into another area (Carey & Asbury 2012).

Table 4-3 Student and academic focus group guideline questions

Student focus group guideline questions
1. Since commencing your studies at university, can you tell me how you have been using computers?
2. Can you tell me about how you are using the online access to your topics?
3. Can you tell me about how you are using the library computers?
a. Can you tell me about how you are using the library databases?
4. Can you tell me about how computers are being used on your placements?
a. Can you tell me about how you are able to access a computer on placement?
5. Can you tell me about using computers and how you are learning at university?
Academic focus group guideline questions
1. Can you tell me about how you use computers as part of your work at the university?
2. Can you tell me about the increase in computer and information technology in the undergraduate nursing program?
3. Can you tell me about how your use of computers has changed since the university has moved to online topic information delivery?
4. Can you tell me about the staff development associated with using computers as part of your teaching?

4.4.2 Post-focus group reflection and transcription

Immediately following the completion of each focus group, the researcher reflected on, and added to, the field notes created during the discussion and highlighted the following aspects: key point of discussion; any notable quotes to be looked for after transcription; any periods of silence that appeared on the tape; and what occurred in the group. Silence, for example, included nonverbal agreement or disagreement. The researcher further extended her reflection process by listening at least twice to the audio tape and adding information to the field notes. The general mood of each group was also noted (Krueger & Casey 2000, Liamputtong 2011). Field notes were also kept to provide an audit trail for each group as a method of ensuring rigour (Koch 2006).

4.5 Interpretive data analysis

Despite the importance of the analysis phase of focus group research, it is acknowledged that the processes used for focus group data analysis are the least well established (Carey & Asbury 2012). There is debate about whether data from focus groups can be analysed in the same way as other qualitative data. Conradson (2005), and Barbour and Schostak (2005) argue that it can, while others such as Wilkinson (2004), Morgan (2010) and Parker (2006) argue that conventional qualitative data analysis methods are inadequate because they do not capture the dynamic and central nature of the group interaction. This interaction is the centre of focus groups and generates a power of insight not found in other methods (Barbour 2007).

When seeking to interpret the data, the researcher adopted the definition of what constituted a theme put forward by DeSantis and Ugarriza (DeSantis & Ugarriza 2000):

> A theme is an abstract entity that brings meaning and identity to a recurrent experience and its variant manifestations. As such, a theme captures and unifies the nature or basis of the experience into a meaningful whole. (DeSantis & Ugarriza 2000 p.362)

She also used the six phase thematic analysis method described by Braun and Clarke (2006). The six phases included: 1) becoming familiar with the data; 2) generating initial codes inductively; 3) searching for themes; 4) reviewing and checking themes; 5) defining and naming the themes; 6) final opportunity to check analysis before producing report (Braun & Clarke 2006).

4.5.1 Becoming familiar with the data

The researcher was the moderator in all 10 focus groups. After each focus group, she listened to the audio file and wrote field notes, recording the group’s general mood and any key quotes for later use. She downloaded the MP3 audio file to the password protected university computer and saved it in a de-identified format in accordance with the ethical requirements of the National Health and Medical Research Foundation (NHMRC) guidelines (Australian Government 2013). The researcher then re-listened to each audio file while reading the verbatim transcription and added information from the field notes at appropriate places. Finally, each transcript was uploaded into N-Vivo™ to facilitate data sorting for the next phase of the thematic analysis.

4.5.2 Generating initial codes inductively

Coding did not commence until after all focus groups were held. Holding all focus groups within a specific time frame was important because it reduced the effect of time and later allowed theme comparison between the student and academic data. The researcher read data from each focus group line by line while listening to the audio file. She highlighted transcript text and created Level 1 initial code names (Braun & Clarke 2006, Liamputtong 2011).

Willis *et al*. (2009) have highlighted the differences between the way focus group discussions and one to one interviews are analysed despite requiring a similar analysis procedure. Three layers of data require analysis when working with focus group discussions: the individual; the group; and the group interaction. The researcher is required to attend to individual dynamics, including the type and range of speech acts (for example, non-verbal and silences), as well as to the context within which the discussion occurs and the content produced (Willis, Green *et al.* 2009). The researcher was conscious of these three layers of data throughout the analysis phase. Adding information to the initial field notes while listening to the audio files and reading the transcripts line by line enabled her to increase the visibility of the third layer of understanding.

4.5.3 Searching for themes

Two main groups of data and associated codes were created after all 10 focus groups were individually coded. The first group contained all student focus group codes. The second contained all the academic group codes. At this point, the codes were refined to represent all students and all academics, and produced “Level 2” codes, also known as “Candidate themes” (Braun & Clarke 2006). Once the researcher had identified refined codes, patterns of text and meanings, themes began to develop (DeSantis & Ugarriza 2000, Braun & Clarke 2006) (see Chapter 5, Phase 1 Qualitative Results).

4.5.4 Reviewing and checking themes

The next step involved undertaking a two part process in which the Level 2 candidate themes were refined, and the existence of internal homogeneity and external heterogeneity was confirmed (Paton 1990). The second part of the review process involved checking the validity of the codes and determining if it accurately reflected the meaning of the entire data set (Braun &

Clarke 2006).

4.5.5 Defining and naming themes

Each theme was analysed in detail to ensure the fittingness of the data included therein. The results from this analysis meant that two of the theme names were altered to better reflect the “essence” of what the theme represented (Braun & Clarke 2006, Liamputtong 2011).

4.5.6 Final opportunity to check analysis before producing report

The researcher worked with her supervisors during the final analysis check to provide another level of review. Following the completion of the review process the qualitative analysis was deemed to be completed.

4.6 Achieving trustworthiness

A distinction is made between primary and secondary trustworthiness criteria. Credibility, authenticity, criticality and integrity are identified as primary criteria for validity, while explicitness, vividness, creativity, thoroughness, congruence and sensitivity are identified as secondary criteria (Whittemore, Chase *et al.* 2001). The researcher ensured that the primary and secondary trustworthiness criteria were met while she undertook the thematic analysis.

During the research process, the researcher constantly checked back with the criteria, aiming to achieve primary trustworthiness, she sought regular written feedback from her supervisors during the analysis process, which involved constantly checking the narrative and her analytical interpretation. She returned multiple times to the original focus group audio recordings to check the narrative transcripts as an additional check for authenticity, aware that qualitative research is dependent on honest and forthright investigations (Marshall 1990).

The researcher met the secondary validity criteria of explicitness, vividness, creativity, thoroughness, congruence and sensitivity (Whittemore, Chase *et al.* 2001) by selecting verbatim quotes from the audio files that represented the richness and attention to detail that emerged from the focus group discussions. She revisited the audio files many times, listening repeatedly to ensure the congruence and sensitivity from the discussion was unequivocally represented in the selected themes and quotes.

The results from the study’s qualitative Phase 1 were used to inform Phase 2, which used a quantitative approach to examine whether issues raised in Phase 1 were applicable in schools of Nursing and Midwifery Australia-wide.

PART B: PHASE 2, QUANTITATIVE RESEARCH METHODS

4.7 Introduction

The aim of Phase 2 was to explore and identify student and academic perspectives about current issues relating to E-learning, the associated computer information technologies and their use in nursing education in Australian undergraduate nursing programs. This part of the chapter describes the sample and setting for Phase 2 of the study, the inclusion and exclusion criteria for the student and academic sample groups, the process of implementing the two questionnaires, the data analysis and integration of Phase 1 and Phase 2 data.

4.8 Participants

It was acknowledged that the Phase 2 quantitative design needed to incorporate a large sample size. Therefore, nursing students from across Australia from all three years of the undergraduate program and their academics were the focus of this phase. Convenience non-probability sampling was used to collect data from these two groups because of time and cost (Chiao-Chen 2013, Nardi 2014, Rowley 2014).

As stated previously, the research was conducted in schools of Nursing and Midwifery across Australia. Heads of School gave permission to the researcher to email an online questionnaire for distribution to all undergraduate nursing students and those academics involved predominantly in teaching in the undergraduate nursing program.

4.8.1 Inclusion and exclusion criteria

Inclusion and exclusion criteria for participation were the same as for the Phase 1 focus groups (refer to Table 4-1 in section 4.2.1).

4.8.2 Sample size

Sample size was based on the number of items used in each of the questionnaires and the number required to meet the recommendation of at least five respondents per item for a factor analysis, and to identify factors underlying multiple items (Hatcher 1994, Osborne & Costello 2004). There were 32 items in the Student questionnaire and 24 items in the Academic questionnaire (see Chapter 6). Therefore, the researcher determined that the student sample size for Phase 2 of the study needed to be at least 160 respondents, and 120 for the academic sample.

4.8.3 Distribution and collection of the two questionnaires

The researcher contacted each appointed person from the 19 schools of Nursing and Midwifery across five states and territories in Australia whose Deans had agreed for their students and academics to participate in the study. Neither questionnaire collected any information that could identify participants. Table 4-5 outlines the data collection sequence.

Table 4-4 Sequence of data collection for the two questionnaires

Action		Issue
1.	19 schools of Nursing and Midwifery agree to participate in student and academic data collection. Questionnaire	Five states and territories represented in the study
2.	Contact made with delegated person from each school of Nursing and Midwifery who agreed to send out the two questionnaires to potential student and academic teaching staff participants who met the inclusion criteria (Wendler & Grady 2008, Bradbury-Jones & Alcock 2010)	Delegated person did not send out the emails to students and/or potential student and academic teaching staff participants after two reminder emails of request
	Delegated person emailed and requested to send reminder email containing link to questionnaires to potential student and academic teaching staff participants who met the inclusion criteria (Schirmer 2009)	Additional responses collected
3.	Students' and academics' completed data collected via separate approved online questionnaire collectors	
4.	Data collection closed after six months following two weeks of no further responses	

4.8.4 Internet questionnaire response

A meta-analysis of 45 studies (Manfreda, Bosnjak *et al.* 2008) found that online questionnaires have a response rate that is on average 11% lower than other modes, such as post and telephone. Another study (Petrovčič, Petrič *et al.* 2016) that investigated eight different ways of constructing emails inviting participants to respond to an online questionnaire found the lowest response rate was 5.4%. However, the group where the invitation carried authority and a plea for help received the highest response rate of 12.8%. Based on using the email invitation script recommended by Petrovčič *et al*. (2016), a response rate of 6% was predicted in the current study.

4.8.5 Follow-up reminders

The use of follow-up reminders has been seen to boost response rates in internet-based questionnaires (Shih & Xitao 2008). In the current study, the researcher tracked the response rates online and sent out an online follow-up reminder to the designated contact person for all 19 schools after 9, 12 and 16 weeks. The contact people were requested to resend the two invitation emails to students and academics.

4.9 Statistical methods

Prior to commencing data analysis, the researcher checked assumptions for applying parametric testing. She used the Kolmogorov-Smirnov test (K–S test), a non-parametric test of the equality of continuous, one-dimensional probability distributions, to examine the individual student and academic data sets with a reference probability distribution (one-sample K–S test) (Pallant 2013). Neither the student nor academic data sets were found to have normal distribution. Therefore, the assumptions of using parametric tests for statistical analysis were not fulfilled. This required the use of non-parametric statistical tests to explore issues related to E-learning and associated technology for nursing students and their academics.

4.9.1 Statistical analysis

The researcher entered raw data from each of the questionnaires into the Statistical Package for Social Science (SPSS) version 22 to conduct statistical analysis. In order to minimise error, another researcher checked the data. A separate code book was maintained to ensure that the coding remained consistent. Prior to the analysis, the researcher reversed the coding used for the negatively worded items on the computer attitude scale for both the student and academic questionnaires to obtain the total attitude to computer scores from the data. She used descriptive statistics to summarise the demographic data. She calculated median and interquartile ranges for computer attitude level from data collected on a 7-point Likert scale.

4.9.2 Inferential analysis

The researcher used exploratory principal component factor analysis and nonparametric analysis because the data was not normally distributed across the two data sets (Tabachnick & Fidell 2014). She performed the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) on both the student and academic data sets to determine whether the data was suitable for a factor analysis. The KMO was 0.822 for the students and 0.862 for the academics. A KMO of 0.6 and above indicates that the data is suitable to undergo factor analysis (Pallant 2013). Next, the researcher performed Bartlett's test of Sphericity on the two data sets, with both returning a significant result of $p<0.001$. Pallant (2013) indicates that a result of 0.05 or less is required for factor analysis to proceed.

The researcher also conducted univariate inferential analyses to test the hypotheses stated in Chapter 7. She used the Mann-Whitney U test to examine differences between two variables and a Kruskall-Wallis test was implemented when more than two variables were being examined. Effect size was calculated for each test, and a Bonferroni adjustment was implemented when conducting post-hoc tests for significant Kruskall-Wallis results to minimise Type 1 errors (Bettany-Saltikov & Whittaker 2013). She conducted multivariate analyses to examine relationships between the variables for both sets of data and the factors identified (see

Chapter 7).

4.9.3 Management of missing data

The data from both student and academic questionnaires was examined for missing values. The researcher made a rule that participants who did not complete the attitude scale were removed from the data sets. This resulted in removal of 26 respondents from the student data set (n=492 participants), leaving a student sample size of 466, and removal of 9 respondents from the academic data set (n=212 participants), leaving 203 in the final academic sample. The data from the students and academics was then tested using the SPSS analysis of missing imputation. The student data had 8% of variables (items from questionnaire not answered) with missing data and 2% missing from the cases (each individual respondent). The academic data had less than 3% of missing data from the variables and less than 6% missing from the cases.

Tabachnick and Fidell (2014) emphasise that missing data can have many meanings in a data set and the researcher is required to examine all of the data to determine if the missing data is Missing At Random (MAR) or if there is a pattern. The pattern may be related to the type of question that was asked and the group of respondents who did not answer a particular question.

The data from both questionnaires was examined using Little’s Missing Completely At Random (MCAR) test (Raaijmakers 1999, Peugh & Enders 2004) to determine whether the data was missing at random. Results from both the student and academic questionnaires were not significant (p=1.0), indicating a random pattern. The researcher used case mean substitution to impute the missing values because the total missing data from both data sets was less than 10% and was MCAR (Raaijmakers 1999, Peugh & Enders 2004).

4.10 Qualitative content analysis of open ended question responses

The last two items in each of the questionnaires were open response questions. The researcher analysed the responses to these using qualitative systematic content analysis. Content analysis as a concept can be found in both qualitative and quantitative research methods. There are two ways of undertaking analysis of textual communications; thematic analysis and content analysis (Tashakkori & Teddlie 2010).

The difference between thematic analysis and content analysis is that thematic analysis arises from a philosophical basis of person centeredness while content analysis has a philosophical grounding in communication theory (Graneheim & Lundman 2004). Both approaches use a “factist” perspective that assumes the data obtained from the participants is accurate and truthful (Sandelowski 2010). However, counting the frequencies of particular words and/or phrases is an important part of content analysis (Morgan 1993, Gbrich 2007), whereas in thematic analysis the importance of a theme may not necessarily be dependent on quantifiable measures but instead on the ability to capture something important in relation to the research question (Spencer, Ritchie *et al.* 2003, Braun & Clarke 2006).

Content analysis is a broad term that that can be used to describe a number of research analysis strategies (Morgan 1993). The analysis involves a systematic approach where textual material is coded and categorised. These codes and categories are then applied to the textual material to determine the frequency of occurrence, and to see whether patterns and relationships between the codes and categories exist within the textual communication (Mayring 2000, Pope, S. *et al.* 2006, Gbrich 2007). Quantitative content analysis also involves the use of algorithms for generalization (Rosengren 1981, Riffe, Lacy *et al.* 2005).

In quantitative content analysis, the data is read and words are counted using developed search algorithms before being coded (Morgan 1993). The codes are then put into tables of codes to summarise what is known about the data. One measure of reliability between raters (the researchers involved in the analysis process) used in quantitative content analysis is to determine their level of agreement with the coding results. Reliability is calculated using Cohn's Kappa to allow for agreement by chance; the closer (more closely aligned the researchers are in their analysis) the calculation is to 1, the more closely the two raters agree (Stemler 2001).

In qualitative content analysis, a researcher would rely on careful reading and re-reading of the data. Morgan (1993) concluded his discussion of the difference between the two types of content analysis by advocating that qualitative content analysis often involves broader categories with more subjective code categories than quantitative content analysis.

The researcher's focus of analysis in the four open response questions in the study reported here was on the "manifest" (the words and/or phrases as they appear in the document) as opposed to the "latent" (deeper meaning that may be found behind the words and/or phrases) (Elo & Kyngäs 2008). Latent content analysis can be undertaken if the data is in the form of an interview transcript where subtle nuances such as silences, sighs and body movement can become part of the interview transcript and are therefore available for analysis (Bloor & Wood 2006, Vaismoradi, Turunen *et al.* 2013). The researcher was unable to place the individual responses in any context other than the text provided on the page because she was not present during the students' and academics' questionnaire completion (Graneheim & Lundman 2004, Elo & Kyngäs 2008). In consideration of this, and of her knowledge of quantitative and qualitative content analysis, she elected to undertake manifest qualitative content analysis.

The researcher also agrees with Granehein and Lundman's (2004) assumption that communication as text will always have multiple meanings and, as such, there will always be some degree of interpretation when the researcher analyses the text. The method used in this study followed the suggested six step content analysis process outlined by Zhang and Wildemuth (2009): preparation of the data; identification of the unit of analysis; identification of the categories and the coding schemes; coding all of the text from the four open response questions (two from the student questionnaire and two from the academic questionnaire); assessing the coding for consistency; and drawing conclusions and searching for meaning.

4.10.1 Preparation of the data

The data the respondents had entered into the online questionnaire for the four open ended questions (two from the student questionnaire and two from the academic questionnaire) was collected via a secure password protected online questionnaire program the researcher could access. She examined all responses manually, line-by-line, several times to ensure she obtained an idea of each response.

4.10.2 Identification of the unit of analysis

The unit of analysis consisted of words or phrases that contained aspects related to each other from the responses to each of the questions (Graneheim & Lundman 2004). Selection of the words or phrases was based on their ability to capture that part of the response that described the various kinds or respondents' perceptions (Graneheim & Lundman 2004, Hsieh & Shannon 2005, Zhang & Wildemuth 2009). Following identification of the units of analysis, the researcher arranged them into groupings of similar words and meanings prior to coding them. The groupings were then tabularised with an extra column for coding (Zhang & Wildemuth 2009).

4.10.3 Identification of categories and coding schemes

The coding process was dynamic, with units of analysis moving between code categories until the boundaries of meaning for each category became clear to the researcher (Hsieh & Shannon 2005). The researcher ensured that each category was clearly defined to prevent repetition of the units of analysis.

4.10.4 Coding all of the text

The researcher then applied the established coding categories to each response and highlighted each code in its own colour throughout all of the responses. She explored information from the textual responses by looking for similar recurring patterns, as well as contrasting opinions. This process allowed the researcher to arrive at an understanding of what issues were important to the nursing students and the academics. The coded items were then considered in relation to each other by exploring relationships or connections, disagreement and repetition.

Following this process, the researcher aligned the coded categories into major and minor categories depending on how frequently the unit code appeared in the responses. She counted all of the coded units of analysis and determined that if a similar textual response appeared more than five times throughout the responses to each individual question, it became a category. She revisited all of the responses repeatedly to ensure that textual communication had not been taken out of context of the entire response, and was not over represented or exaggerated.

4.10.5 Assessing for coding consistency

The researcher reviewed all of the categories to assess whether any could be merged or a separate sub-category was needed. This involved comparing all of the categories to ensure that each coding signified the exact meaning and matched the category name. Coding consistency was discussed and verified during the researcher's regular meetings with her supervisors before proceeding to the next step in the analysis process.

4.10.6 Drawing conclusions and searching for meaning

The final step in the content analysis process involved exploring the dimensions of each category, identifying relationships between categories and checking for patterns against the entire data set from the four open response questions. This was done to reconstruct meanings derived from the textual data to reaffirm the pertinence of the categories identified. Upon verification of the structure of the categories, the researcher tabularised the final categories, with quotations providing support for the text.

Having completed the data analysis of data from both phases of the study, the researcher took the next step in the mixed methods research design used in her study; integration of the qualitative Phase 1 data with the quantitative Phase 2 data.

4.11 Brief overview of data integration throughout the research study

The integration of both qualitative and quantitative data greatly increases the value of mixed methods research (Bryman 2006, Creswell & Plano Clark 2011, Fetters, Curry *et al.* 2013). The researcher was aware that integration in mixed methods research studies is a process that occurs throughout the study (Yin 2006, Bryman 2007, O'Cathain, Murphy *et al.* 2007). Bazeley (2010) put forward the following definition regarding integration in mixed methods studies; a definition supported by Bryman (2007), O'Cathain *et al.* (2007), Fetters *et al*.(2014), Yin (2006) and Wolley (2009):

> Integration can be said to occur to the extent that different data elements and various strategies for analysis of those elements are combined throughout a study in such a

> way as to become interdependent in reaching a common theoretical or research goal, thereby producing findings that are greater than the sum of the parts. (Bazeley 2010 p. 432)

The integration narrative will highlight the “fit” of the integrated data; where the data provides confirmation (where Phase 1 and 2 support each other), expansion (where findings from both phases diverge and expand insights on the phenomenon of E-learning in undergraduate nursing and midwifery programs in Australia), and where there is discordance (where Phase 1 and 2 results are inconsistent, incongruous, and contradict or disagree with each other) (Fetters, Curry *et al.* 2013). Discussion of the integrated results is presented in Chapter 9.

4.12 Summary

This chapter has described and justified the methods used for the Phase 1 qualitative data collection and analysis, and the Phase 2 quantitative data collection and analysis, including adherence to the ethical guidelines approved by the Flinders University Social and Behavioural Ethics Committee. Part A has explained how 10 focus group discussions were held, five with students and five with academics, the participant criteria and recruitment from one Australian university undergraduate nursing program, and how a six step thematic analysis process was undertaken to generate the Phase 1 findings, which are presented in the next chapter. By providing a thorough discussion of the rationale for each step of the research process, the researcher has demonstrated how additional rigour was assured by conducting the analysis in this systematic way.

Part B has explained the exploratory Phase 2, non-intervention study design, participant criteria and recruitment from 19 universities across Australia, and the descriptive, parametric and non-parametric statistical methods used to analyse data from two questionnaires (one for students and one for academics). This included an overview of qualitative content analysis and the steps undertaken to identify participants’ responses to four open ended questions. Chapter 6 outlines and discusses in detail the processes used to develop and validate the student and academic questionnaires. The Phase 1 qualitative results are presented next in Chapter 5.

Chapter 5 Phase 1 Qualitative Findings

5.1 Introduction

In the previous chapter, the methods used in the qualitative Phase 1 of data collection and analysis were explained. This chapter, presented in two parts, details the findings of the thematic analysis of Phase 1 data. Part A contains findings specific to the student focus groups while Part B contains findings from the academic focus groups. These findings were derived for the purpose of gaining understanding from both students' and academics' experiences of E-learning and its associated information computer technology (ICT).

In total, there were 27 student and 25 academic participants across 10 focus groups. The student population included students from all three years of the undergraduate nursing program at one university in Adelaide, South Australia, including graduate entry students who undertook an accelerated two year program and two students undertaking a 12-month Bachelor of Nursing program to upgrade their current registered nursing qualifications (see Table 5-1). The academic population included those employed on a full or part time basis who identified as "teaching" predominantly in the undergraduate program. All participants used E-learning and its associated technology in their study or work. Twenty-three of the 25 academics identified as teaching predominantly in the undergraduate Bachelor of Nursing, while two identified as teaching predominantly in the Bachelor of Midwifery (see Table 5-2).

Table 5-1 Characteristics of student participants

Students (*n*=27)		**Pathway enrolled into the Bachelor of Nursing undergraduate program**
Focus Group 1 Student (FGS1)	*n*=4	4 students in 3 year Bachelor of Nursing program
Focus Group 2 Student (FGS2)	*n*=5	5 students in 3 year Bachelor of Nursing program
Focus Group 3 Student (FGS3)	*n*=5	5 students in 3 year Bachelor of Nursing program
Focus Group 4 Student (FGS4)	*n*=9	3 students in 3 year Bachelor of Nursing
		3 students in 2 year graduate entry Bachelor of Nursing pathway
		2 students in the 1 year Bachelor of Nursing pathway for RNs
		1 student in the 2 year Bachelor of Nursing pathway for ENs
Focus Group 5 Student (FGS5)	*n*=4	1 student in 2 year graduate entry Bachelor of Nursing pathway.
		3 students in 3 year Bachelor of Nursing program

Table 5-2 Characteristics of academic participants

Academics (*n=25)*		Program taught in
Focus Group 1 Academic (FGA1)	*n*=5	All predominantly taught in Bachelor of Nursing undergraduate
Focus Group 2 Academic (FGA2)	*n*=5	All predominantly taught in Bachelor of Nursing undergraduate
Focus Group 3 Academic (FGA3)	*n*=6	All predominantly taught in Bachelor of Nursing undergraduate
Focus Group 4 Academic (FGA4)	*n*=5	4 predominantly taught in Bachelor of Nursing undergraduate
		1 taught in the Bachelor of Midwifery program
Focus Group 5 Academic (FGA5)	*n*=4	3 predominantly taught in Bachelor of Nursing undergraduate
		1 taught in the Bachelor of Midwifery program

The process of generating the themes from the student and academic focus group data has been described in Chapter 4 in section 4.5, “Interpretive data analysis”. The principles of naturalistic inquiry that allow researchers to bring their own understanding of the phenomena under study to the research context and data analysis have also been discussed in Chapter 4.

5.2 Reporting focus group data

The data from focus groups can be reported in a number of ways. The group’s collective view can be reported or individual participants’ narrative from the group can be reported, as in this study (Hennink 2014). Several authors agree on the value of analysing each participant’s data as well as the collective data from the focus group because the combination of individual and group findings reflects the group nature of data collection and its influence on shaping individual comments (Barbour 2007, Liamputtong 2011, Guest, Namey *et al.* 2012, Hennink 2014). However, Barbour (2007) contends that: “Focusing on individual voices ... is particularly helpful in determining the extent to which a perspective is a collective one” (Barbour 2007 p.131).

Accordingly, in this study, the identified themes are supported by quotes from individual participants to provide explicit understanding, and evidence, of the issues for students and academics while they engage with E-learning and its associated ICT. All participants have been given a number, which is found at the start of each quote. The notation at the end of each quote identifies which focus group the participant came from, for example FG5S represents student focus group five. Some students have more than one comment. These additional comments have been included to provide further justification of each theme.

PART A: STUDENT FINDINGS

5.3 Introduction to the student findings

The researcher identified two main themes from the student focus group discussions about issues associated with using E-learning during their nursing degree. The first theme provided evidence that many undergraduate nursing students found a number of positive aspects about using E-learning and its associated technology. This theme was called, “Students were positive about aspects of E-learning”. The second theme provided evidence that many undergraduate nursing students found negative aspects about using E-learning and its associated technology. This theme was called, “Students were negative about aspects of E-learning”.

5.4 Students were positive about aspects of E-learning and its associated technology

Students were positive about the flexibility E-learning and its associated technology provided. They embraced the university’s online learning management system (LMS) for a variety of reasons, including the increased flexibility and mobility afforded by the ubiquitous nature of the internet, which allowed access to their learning resources at any time and in any location covered by an internet connection. Students enjoyed, and felt they learnt more from, the extra dimension offered by high fidelity simulation in their nursing laboratories. They also appreciated that they were able to connect online to their friends inside and outside of university through the use of social media. As student 25 explained, ICT and its associated technology enhanced their learning:

> Student 25: *I love LMS, I learn a lot, I know what I’m doing, I go in the morning and in the afternoon I have to go and check, especially when students talk to each other. … I come to uni only once a week and it’s not enough and for the rest of the week I know I’m right. I love it. …* [LMS is] *very good, for microbiology I remember I went through it every night and it was fantastic because especially with some lecturers you’ve got to attend the lecture and you just write it down and then that’s it, but now you can do it by yourself even if you get all the books ready but you don’t know where to start* (FGS5).

> Student 7:*… I absolutely love it* [LMS], *… I don’t live close and if I’ve just got a one hour lecture I’m not keen to waste all that petrol and time. It’s* [LMS] *great, like tonight I will be watching Monday’s psych and nursing in context lectures, it’s fine … I guess that’s also a lifestyle issue for a lot of people is that the thing that does help, LMS does help, is that some of us are up at five am in the morning and I’m on LMS at five am but I’m also in bed at seven pm, whereas other people ... they’re studying at ten pm at night whereas I’m not, so LMS does allow us that flexibility* (FGS2).

> Student 19*: You can stop it* [LMS online lecture] *and play it and can actually think through a comment which is probably like … instead of just passing over it and not getting it* (FGS4).

> Student 20*: I find that* [LMS] *really useful because it’s hard for me to come, it’s a long way for me to come for a lecture and if I can watch it at home when kids are sleeping and the housework’s done, or I can listen to it when I’m doing housework, like I really like the*

podcast because I can listen to that and do housework at the same time. I can get stuff done as well instead of coming all the way down here, like an hour's drive, to watch a lecture and then if you don't listen to everything really carefully it's gone unless you're taking lots of notes, but if it's recorded and you can save it and listen to it again you can get more out of it. Or if you go back you can go to your tutorial, and if you didn't understand something you can go back and listen to the lecture again. I like podcast (FGS4).

Three students commented on how they enjoyed the E-learning experience of using the high fidelity simulation (SimMan®) in the nursing laboratories:

Student 19*: … SimMan® is awesome* (FGS3).

Student 20: *I like the use of SimMan® and also like the media; anything that's more, any use of media or technology that kind of helps immerse you more in the moment or the visual kind of stuff just helps so much more* (FGS4).

Student 16*: SimMan® is a step up from just a doll that sits there but I mean it's good for learning, it's just a little bit confronting* (FGS4).

Students also found the online learning system assisted them to feel connected to the university, their fellow students and their studies.

Student 13*: I think LMS is really good, it makes me feel really connected to the university when I'm not here and pretty much most of your questions are answered if you read it all … I don't feel isolated; I haven't asked one question, it all unfolds slowly* [on the online discussion forum] *if you keep up with it* (FGS3).

Student 27*: I think it's* [LMS] *great. I only come here once a week and I'm on it all day, I just keep it on, I keep checking it all the time. I think it helps me connect that I am a student and I like to keep up in the sense of wanting to know what's going on. LMS helps me keep connected and keeps me focused about what I'm meant to be doing* (FGS5).

The flexibility offered by ICT and the university online LMS enabled students to incorporate it into their everyday life. Their university study appeared to merge into their way of using computers for social media such as Facebook™, which they used to source information for their nursing studies:

Student 13*: Last year with second year, I know the first years had a whole big Facebook™* [site] *and they were all talking to each other through Facebook™* (FGS3*).*

Another student explained how she would be connected to social media at the same time as she was studying on the computer. This strategy enabled the student to remain connected with her friends who were not at university:

Student 20*: … I don't think about it ... more natural if it's a Facebook™ group or someone's posted on there, so while I'm chatting to my friend I'll read and kind of see they've been doing this and this, okay I'll have a bit of an input there and so it kind of takes the isolation off my uni life and my life, and it integrates it more into ... makes it more of a profession. Nursing is a profession, it's our life, it's what we do and it brings it more into this is my life, this is part of who I am talking about, these kind of issues in nursing* (FGS4).

The same student described how she used social media to recap what was covered in the university classes that day, and how she found this method of interaction easier than accessing the university system because she could easily see who was online:

> Student 20*: We don't set up groups or anything but because a lot of people are on Facebook™ you tend to see that they're online, so we do sort of cover stuff about university and class; it's more on an ad hoc basis, private chat to each other* (FGS4).

Another student spoke positively about how she accessed internet applications that provided an additional learning resource while she was out on clinical placement. She had also embraced social media as a strategy to decrease her perceived isolation:

> Student 7*: I use applications on my iPod, medical applications like drug calculations and I've got a pharmacy, like it links up to the internet and you can type in the drug and it will tell you what it is used for, what the contraindications are … I'm addicted to them all* [social media networks] *and it's because that was banned in State Government* [previous employment], *and so my reaction was, being a single mum stuck at home on the weekend with a little baby, "I'm going to have all these accounts so when I'm home alone with baby I can participate in contact with the outside world"* (FGS2).

The way students described how they used social media to contact friends who were nurses, and seek advice or information for their university studies, was another example of a positive aspect of E-learning and its associated technology:

> Student 19: *I have been contacting* [through social media] *other friends that are doing nursing as well and that's been helpful. Easier to access than sending them an email through* [university name] *because most people are on there* [social media]… (FGS4).

> Student 27*: … sometimes I use Facebook™ to ask certain questions to other people who I know are nurses, so I use that to get an answer* (FGS5).

One student said that she used social media to discuss university matters of a general nature that were not related to an assignment:

> Student 26: *I find I'll use Facebook™ for instance if I'm doing a group assignment, if I'm also friends with the students I'll speak to them on Facebook, but it tends to be more general conversation about uni rather than ... I think if it was focused purely on a particular assignment I'd probably send them an email* (FGS5).

5.4.1 Summary of the theme Students were positive about aspects of E-learning'

The students' comments provide evidence of perceived positive aspects of E-learning, including the flexibility of studying in the online environment; 24 hour access, seven days a week; access to their learning materials; and contact with their fellow students. E-learning facilities appear to have enabled many student participants to engage more easily with their university studies and to enhance their learning. Social media had a role to play not only in connecting with other nursing students but also in assisting students to stay connected with their friends who were not at university.

Whilst many student participants were positive about E-learning and its associated technology, at times some struggled to use ICT.

5.5 Students were negative about aspects of E-learning and its associated technology

In all focus groups, the researcher found student participants made many more negative comments than positive comments. Following thematic analysis, these negative aspects were grouped into three sub-themes: 1) Frustration; 2) Fear when using computers; and 3) Low levels of CIL skills. The third sub-theme was divided into two other areas of concern for the students: the Online enrolment process; and Accessing library resources.

5.5.1 Frustration

At the time of the study, the school of Nursing and Midwifery involved in Phase 1 of the study moved in one semester from paper-based physical submission of assignments through a slot in the wall of the school office to electronic online submission via the LMS. The school held the expectation that all students would be able to submit their assignments electronically. However, students described how the university computer system failed them, which caused them a high level of frustration. While students were aware that sometimes the issues were with their own equipment and internet connection, they were also aware that at other times it was the university computer system's capacity to cope with a cohort of over 400 students all trying to submit their assignments within sixty minutes before the due date and time expired that caused problems. Uncertainty about how the computer system would behave was a source of frustration for students, for example:

> Student 26*: I expect a lot from it* [LMS] *and then when it doesn't work I get really frustrated … I've tried before but I don't think I can ever get it to work because my partner used to put them* [MP3 files of lectures] *on his iPod and then listen to them on his way to work and I thought, "What a great idea", but I've just never been able to make it happen. Maybe I haven't tried hard enough* (FGS5).

> Student 11*: I get very frustrated when things don't work the way they should, so the university says "We want you to use this technology", I use that technology, don't have a problem with that, and you go to use it and you could lose the will to live waiting for it to respond, and it's not always just your connectivity time, it's quite often that there are issues with, like LMS* (FGS3).

As mentioned above, sometimes the student's own computer equipment and/or internet connection speed interfered with the student's ability to access E-learning resources such as remotely viewing online recorded lectures. This lack of control over the quality of delivery of internet resources was also a source of frustration.

> Student 21*: Which is another thing, the electronic submission. I don't know whether it's the servers here or whatever aren't big enough because it takes like, … we have problems when we put things through Safe Assignment, it just takes forever or crashes and that happens quite a lot. People put stuff on the computer for everyone to see as long as they make sure that it works, and it goes back, because that's a real time waster and it's very*

frustrating. … I'm a bit frustrated because the graduate entry lectures are supposed to have been recorded but they haven't been placed up yet (FGS4).

Student 27*: I've used it* [view lecture remotely] *too but I don't like using it because when I need to stop it, it freezes and I want to go back five minutes but then it takes me twenty minutes by the time it's gone back. It's so frustrating when it* [LMS] *doesn't work properly* (FGS5).

Student 8*: I find LMS just to be really cumbersome, I try not to look at it, I have to look at it to know what I need to do but I minimise my contact with LMS because it just infuriates me to the point that I actually get stressed about LMS and I'm already stressed about my degree anyway so it's just an added stress I don't need. It's that stuff [*LMS not working properly*] I reckon is the straw that breaks the camel's back. It's all fine until something like that happens and you just go, "That's it". It should be like you said, relatively straight-forward* (FGS2).

Apart from feelings of frustration, student focus group members shared how they experienced other feelings when using the university computer systems. The following sub-theme, Fear when using computers, provides evidence of these feelings.

5.5.2 Fear when using computers

Using computers at university was a very daunting and fearful experience for some student participants. They expressed feelings such as fear, terror and being overwhelmed in addition to feelings of frustration, even though they had been using computers prior to coming to university, for example:

Student 6: But you've been using computers obviously prior to coming to university haven't you?
Student 9: Nothing like LMS. I was terrified (FGS2).

Student 11: Personally, the computer side of things kind of freaked me out, I was lost, completely lost, so it was a little bit overwhelming in that respect. So I think if you've got more computer skills it might not be so daunting (FGS3).

Tutors encouraged students to post comments and queries onto the topic discussion forums located on the secure university LMS but students' low CIL contributed to their stress and fear; they were unable to complete this activity:

Student 11: And then you have the stress of "What if I've posted it in the wrong place, what if it didn't go through, what if, what if, what if?" I find it daunting (FGS3).

One student stated they were scared about accessing the online discussion forum because of the amount of information shared by other students:

Student 26: *I found in the past when I do get onto the discussion forums it's usually when I'm doing an assignment or something, and it leads me off track or makes me scared about other things because you'll read what people are getting scared about and then I'll end up thinking the same. So I don't really like the forum a whole lot* (FGS5).

Another student felt scared and intimidated when they first started at university because all of the services and topic information were online. The researcher noted that other students from the same focus group nodded in agreement with the student's comments:

> Student 8*: You're scared, you're intimidated by being at university in the first place, you don't know where you've got to go, you know there's a* [computer] *system that you have to follow but there's no real introduction to it and then there is LMS and then sometimes people need help with the library as well* …(FGS2).

Yet another student explained that some graduate entry students [in her cohort] were missing appointments with staff, and missing out on lectures and skills sessions. The student went on to explain that some of the students were becoming "quite panicked" because of their low CIL levels; they were unable to navigate their way through the LMS to locate required information:

> Student 7: *They* [graduate entry students] *can't become computer literate and pick up the work* [nursing specific knowledge] *at the same time so what's happening is they're either missing out on lectures, meetings, appointments because they're not getting the information or they're missing out on their skills and their actual study; one or the other is happening and they're actually getting quite panicked* (FGS2).

As evidenced in the comments above, the low level of CIL was an issue for a number of students and forms the title of the next sub-theme; Low levels of computer information literacy skills.

5.5.3 Low levels of computer information literacy (CIL) skills

At the time of data collection in 2012, the participating school of Nursing and Midwifery did not offer any remedial CIL courses for commencing students. However, it did provide an introduction to the university LMS and tours of the library to see the computer terminals available for student use. During orientation week activities, staff from the university's Student Learning Centre also held a session to introduce commencing students to the services they offered and how students could access these either online or at face-to-face sessions. Nevertheless, students shared how, during their first few weeks at university, they were overwhelmed with information and this feeling was compounded by their lack of skills when attempting to access information via computers. They felt that they not only had to cope with receiving large amounts of information but were also required to have the skills to access information via the LMS:

> Student 11: *Well you're told so much when you first start you don't take it in; it doesn't kind of register because there's, it's so overwhelming starting a university course and especially if you're computer challenged, you're trying to deal with IT stuff and just getting that into your head and then you've got all this other stuff being thrown at you and some of it kind of goes by the wayside. I don't know whether there should be a workshop or something using the technology or what's expected* (FGS3).

One student undertaking the two year graduate entry program expressed concern that she and many of her fellow graduate entry students had not used computers in their previous degree, and now they had to become computer literate in addition to learning a new body of nursing knowledge:

> Student 20: *… not only having to adapt to a whole new area of learning but having to adapt to different formats of study, method of delivery than they would've had before, and some of them were saying that in previous degrees they never had to use computers, so a lot of the graduate entry students are saying to me, "I've never had to use a computer before, so not only am I having to learn nursing and pathophysiology, I'm also having to learn how to use computers, and all of this at the same time"* (FGS4).

Another student from a different focus group spoke about similar concerns regarding the CIL levels of some of her fellow gradate entry students:

> Student 6: *But the thing is we're thinking of ourselves as pretty computer literate people but you've got new students coming in saying, "I've done a degree already, I'm coming in as a graduate entry student and doing a nursing graduate entry and I haven't used a computer before in my degree and now I'm expected to be doing LMS and learning all this stuff". Imagine how they're doing it* (FGS2).

The researcher saw the emerging theme of low level of CIL and how students were expressing high stress levels associated with their self-reported low level computer skills. One commencing student explained that in spite of the introductory lectures about how to use the university computer systems, she lacked confidence and had little idea about how to use it:

> Student 9: *I haven't ever tried the discussion system on LMS, I'm a new student, so I just started my course two weeks ago and I attended LMS orientation before that last month on how to use it but I'm not confident yet, so probably because I don't have time and I have no idea how it works* (FGS2).

Another student acknowledged that for some students, their low level of computer skills was the reason why they were unable to use the university computer systems successfully:

> Student 20*: … they* [other students] *don't actually know it and so it's not necessarily that the technology is bad, it's just that we've been poorly informed or poorly educated about how to use it* (FGS4).

> Student 8*: And that's the thing, it goes back to your computer and your knowledge and then like I said before, you're stressed anyway so you think, "Oh well, have some chocolate and turn it off"* (FGS2).

One student from overseas explained that they did not know how the university computer system worked and that if the online lectures for the topics did not work, they did not know what to do about it:

> Student 18: *The LMS is very good when it's working but sometimes, like me, I'm from overseas, I don't know how it works. Basically I feel a little bit to understand is like when I open LMS and go to the video lectures, then it won't work* (FGS4).

Student's low level of computer skills caused confusion for one student as she tried to engage with the online topics:

> Student 16*: Sometimes I found that it does and then other times it goes to another page where it has like four different links that it can go through, I mean I've been through all the links that it can go through and it says it won't do it or it won't load or something because it gets a bit confusing* (FGS4).

Students struggled with low levels of CIL, which hindered their ability to access the required online resources for their nursing topics. Low CIL was also a key issue when some students had to enrol at university. The first sub-sub-theme, “Online enrolment process”, illustrates how students found their first encounter with the university computer system particularly intimidating.

5.5.3.1 Online enrolment process

Some of the student participants expressed the feeling that the online enrolment process was a negative first experience with the university’s online system. The lack of clear directions to step students through the enrolment process made it a very drawn out, confidence depleting process. The researcher found evidence across a number of student focus groups regarding difficulty with the online enrolment process for both commencing and continuing students:

> Student 19: *When I enrolled and everything and had to go on the computer and do everything we’re supposed to do it took me a good six hours to even figure out how to enrol, register etcetera. My previous degree wasn’t here so I’d never been to* [university name] *before and there was nothing to tell you how to do it and the little bit information that you can get makes no sense at all, and it was a horrible experience I had trying to do stuff from a computer apart from when they crash and die. …that* [the enrolment process] *was horrible* (FGS4).

> Student 11*: … then when they said to me “You need to enrol online and then you need to register in topics and then register in classes”, and I went, “What?”. So I think if you’ve got more computer skills it might not be so daunting* (FGS3).

One student with a low level of computer skills in the third year of the program avoided the enrolment process altogether by getting her partner to do it for her:

> Student 26*: But when I came to enrol I still hated it. My partner had been at* [university name] *the year prior so I got him to enrol for me. I still hate enrolling* (FGS5).

In addition to the difficulties student participants encountered during the enrolment process, a number of students across the focus groups found accessing and using the university library website particularly difficult. This issue became the second sub-sub-theme, “Accessing library resources”.

5.5.3.2 Accessing library resources

The library website was challenging for some student participants who had difficulty navigating their way through its web pages. Others felt they needed more education and training about how to effectively search the many databases available through the library:

> Student 18: *It’s* [Library web site] *not easy to find either* (FGS4).

> Student 17*: They* [the Library web pages] *are not user friendly, it’s really confusing and because we were accredited in the second year* [commenced their studies in second year] *and we missed the first year of how to go about searching databases and stuff… Still struggling, it’s not easy to get the articles* (FGS4).

> Student 26*: I wish the Uni* [library] *wouldn’t even link me to those, I think it’s* [database] *or something and I’m like, “Why do you send me there if I can’t access the article anyway?”*

> *(FGS5).*

Another student knew they needed to access journal articles from the library but was unable to use the computer system to gain access to them:

> Student 7*: I'm lost with that* [library website], *I just don't understand how to do it. I'm aware there are journals and articles and things but I don't know how to access them* (FGS2).

A very concerning comment from one student about their level of skill in accessing the databases in the library reinforced for the researcher that many students had not been adequately equipped with the skills required to study at the tertiary level, yet they had reached the final year of their degree:

> Student 13*: I've got a feeling with the database and searching articles I might actually get through this whole degree without actually learning how to use it* (FGS3).

5.5.4 Summary of the theme 'Students were negative about E-learning and its associated technology'

Students' negative feelings about using E-learning and its associated ICT ranged from frustration when the university system or the student's own equipment or internet connections did not work as expected to feelings of being fearful, overwhelmed and confused. The students' comments illustrate that these emotions impacted their ability to learn. Inability to access lectures and/or vital information, and confusion navigating the online library resources to find the books or journal articles they needed for assignments meant students were unable to participate fully in the program. In some instances, ICT impacted their very entry to university and the nursing program because they had difficulty navigating the online enrolment process.

The students' comments indicate that even though the university and school provided orientation overview sessions on how to use the online resources, students' low CIL levels remained problematic.

The next section describes the findings from the academic participants' focus groups.

PART B: ACADEMIC FINDINGS

5.6 Introduction to academic findings

The researcher identified three main themes from the academic focus group discussions about issues using E-learning and its associated IT. These were called "Positive about aspects of E-learning and its associated technology", "Negative aspects about E-learning for academics" and "Professional development".

In the first main theme, academic participants across all focus groups described and discussed learning styleswith each other how they already incorporated aspects of E-learning into their teaching. They spoke freely about their positive experiences of using E-learning and its associated technology. However, much of the discussion focused on the potential of what participants would like to do in the future, using media and internet connections in classrooms that would be adequately equipped to deliver these innovative teaching methods.

The second main theme was also found across all focus groups and was divided into seven sub-themes: Lack of teaching resources; University technology out of date; Time; Frustration; Resistance; Depth of student learning; and Equity associated with E-learning technology.

The third main theme, like the first two, was found across all focus groups and focused on the lack of effective professional development being offered to academics. Participants also discussed how their time was not efficiently used because what they learnt was not practiced

5.7 Positive about aspects of E-learning and its associated technology

Academic focus groups participants expressed a variety of reasons as to why they were willing to use E-learning and its associated technology. Reasons included the ability to reuse and organise learning resources, to accommodate different learning styles to provide a greater choice for students, and to rapidly access information in the classroom, for example:

> Academic 14: *… I think it's a really good idea, video streaming lectures and you can also access previous years if you haven't got a really good lecture. You can send them back so they sit on that repository permanently, so I think that's very useful to access previous lectures from previous years* (FGA4).

> Academic 23: *I've put every lesson onto PowerPoint™and so I've got all my links and everything, it's been a really nice way of organising and changing things around. I still have my handouts and stuff but I've put as much as I can onto e-reserve, I've put articles onto LMS, all the forms for their stipends and their scholarships. I've got all my links and everything; it's* [using LMS] *been a really nice way of organising and changing things around* (FGA5*).*

> Academic 8: *… I'd find E-learning really good … so if we're going to be thinking about really tapping into the way people learn best and therefore decreasing the stress associated with learning and improving the retention of what they actually have, if you're an audio-visual learner, for example, and I am. … The other advantage of E-learning stuff is I think it can address more learning styles, and learning styles I think is something that we are not always that great at; the universities are set up for conceptual learners and 90% of the population is not that. … one of the fantastic things about LMS Live was that you could record lectures and people* [students] *can come back later on and get on, if they're not in the time zone or they're doing shift work and can't come to your lecture at the time …* (FGA2).

High fidelity simulation was used with the second and third year students to assist in their development of clinical reasoning skills and to enhance their teamwork skills. One academic compared the learning available from a book with the learning possible using scenario-based simulation learning with the high fidelity mannequin (SimMan®):

> Academic 8: *…I think with* SimMan®*, I mean one of the beautiful things about high fidelity learning is that you can teach context which you can't teach just by giving them a piece of paper. Say for example you're wanting them to look at or to read a book, you can't do it with books, teaching students to look at the whole picture, what's happening with a patient, a deteriorating patient so that they can intervene early rather than later* (FGA2).

The capability provided by E-learning to immediately demonstrate concepts to students and to access information from the internet was seen as a very positive aspect, for example:

> Academic 24: *It's* [LMS live] *really good too because if you want to show how something is done because you can actually drop it back and pull up a webpage, you can kind of say, "Right, I'm going to change the screen now, this is where we start", and they can see step by step how easy it is. … In a way it's a matter of also defining the appropriate place and one of the things which I love is when actually students bring computers in* [to the face-to-face classroom] *that are wireless, and wireless connection is fantastic, I so love that …* (FGA5).

Academics actively planned how E-learning could be integrated across the three years of the undergraduate nursing curriculum. One stated:

> Academic 10*: I think it creates more modes of delivery, it's enabling of creativity I guess, it allows different pedagogical methods* … (FGA2).

Academics were willing to develop specific online teaching programs that promoted deep learning through context rich resources, such as virtual hospitals, as a participant in focus group 2 explained:

> Academic 7: *We're talking now, although we haven't done it yet, of having virtual hospitals and having avatars* [virtual reality characters] *and whatever else that we do, it will be interesting to see how, with the students that have grown up with play station and all that sort of stuff, how much that will impact their learning because I think that when they can relate to nursing in that way, while it's not the real world, it might actually help them put some things into place and retain information* (FGA2).

The same academic then commented on how academics need to be able to take risks with using technology and developing learning resources:

> Academic 7: *… I think it* [E-learning] *allows us to do more and if we're bold and willing to take risks with technology, and you can only do that to a certain extent, and it actually has improved my ability to get to more students to have a learning experience, more students in my opinion … It allows rapid access to info, articles online and so forth, it is very, very rapid and so I think it's also aiding part time study as well. E-learning, they're* [students] *able to work but also do it part time but still have this rapid access and 24/7 to articles from here to Swaziland* (FGA2).

Academics who were willing to be involved in the development of online resources were content experts but required assistance from computer technologists to enable development of many of their teaching innovations. These academics discussed how a virtual world hospital ward has the potential for use not only by their own university's nursing students but also by students from other universities in a different time zone, akin to a staff shift change in a hospital:

> Academic 5: *… so something like a 24 hour reality, there're patients on this ward, there's different shifts that people are looking after these patients, some of the workers are in other parts of the world but it doesn't matter, I think that would be good …* (FGA1).
> Academic 2: *… I'm* [developing scenarios] *going over 24 hours or a week. You could link it all to assessments so you could analyse the student's progression; how well they cared for a patient, whether they looked at their needs, you could link that with case notes and that as well so they have to know their patient beforehand and they have to do things throughout, but I don't know how to do it* (FGA1).

The same academic went on to comment about the possibility of developing E-learning programs and then continuing the themes across the three years of the undergraduate nursing program:

> Academic 2: *But we could do it across different topics if we had something set up first and then we could add to it. There's bound to be one of those where we could use our patients from first year to third year and make them more complex* (FGA1).

Several academics were looking forward to what the many new computer technologies had to offer in nursing education, for example:

> Academic 14: *… we could explore and I think that would be incredibly valuable and personally lots of fun; I mean this whole idea of these smart boards and all that sort of stuff that we're aspiring to that hopefully will open up a whole lot of avenues* (FGA3).

> Academic 16*: I think it* [E-learning] *creates more modes of delivery, it's enabling of creativity I guess, it allows different pedagogical methods etcetera* (FGA3).

> Academic 9: *… designing our assessment to ensure that we keep up with technology* (FGA2).

Academics took seriously, and spoke positively about, their responsibilities to develop students' computer and information literacy (CIL) skills levels across the program. One felt that a certain level of CIL was expected of university academics, but at the same time acknowledged that academics do not need to be technology experts:

> Academic 10: *I believe it's a fundamental requirement that we do keep up with a certain level, whatever that level is, and we all can't be whiz bang at everything because that's not our* [job], *but I do think we have a responsibility to have certain levels given we will operate poorly if we're not aware of some of the technologies that can help our efficiency and help our methods* (FGA2).

One academic was clear that quality pedagogy was essential in both the face-to-face and E-learning environments:

> Academic 20*: Can I say something about the quality of learning and whether it's E-learning or face-to-face, I think they depend on the same thing, which is that interaction with the teacher or the academic. If you've got an E-learning environment that just allows the student, gives access to the student and the student is left to their own devices, I think that's very poor, poor teaching, so there has to be that interaction on E-learning. I think that's really important* (FGA4).

A number of academics across the focus groups saw providing direction and examples of high quality online references for evidence-based care when students were developing their assignments as an important role. They also saw that facilitating an increase in the student's level of information literacy as their responsibility:

> Academic 9: *It's our job as academics to know what the quality is, to know how to direct them to the quality, to make sure it's applicable, it's relevant, it's recent if that's what's necessary and that it's credentialed as well if that's what's necessary, and that the authors are credible …* (FGA2).

The same academic later explained that it was important to engage students in discussions around information literacy, in particular the issues of credibility and quality of online resources from the internet:

> Academic 9: *… credibility into quality and I think it's up to us too to engage them in discussions about whether or not it is credible and whether or not it is applicable with what they're finding. I mean, Wikipedia, I agree completely with you but there are a lot of other sites that may not be applicable and it's our role I think because we've got, hopefully, the knowledge to be able to associate and discern between those differences and direct them in the right area* (FGA2).

A number of academics across the focus groups raised the issue of increasing students' level of information literacy, for example:

> Academic 16: *But it's that telling them how to look for the legitimacy of what is on there, so is it evidence-based, who wrote it, what's the credibility of the person who wrote it, I mean you have to do that for anything anyway* (FGA3).

> Academic 8*: I think you need to teach them how to be discerning of quality because we can't tell them all the sources that are good and so that would be, again if they just learn black and white which ones, they're going to go and get My Virtual Hospital or My Doctor.com or speak to Dr so and so, and it's got nothing necessarily credible. I think you need to teach them how to find that* (FGA2).

> Academic 24: *Security and credibility is the thing that's coming up because of the access, because there are so many things that are available; it's one of the things we talk about with credibility of sources when doing researching* … (FGA5).

5.7.1 Summary of the theme "Positive about aspects of E-learning and its associated technology"

Academic participants described how E-learning and its associated technology had improved their teaching in terms of organising teaching across the semester and using high fidelity simulation to provide students with the context of nursing that had not previously been possible in the nursing laboratory environment or by learning from books. Academics took their role of increasing students' information literacy levels across the three year program very seriously, including informing students about how to discern the quality of internet sources and actively involving students in discussions about this issue.

The researcher found the same situation in the academic focus groups as had occurred in the student focus groups; that academic participants, like student participants, had far more negative comments about using E-learning and its associated technology than positive comments. The negative aspects expressed by academics (theme 2 with sub-themes 1-7) are revealed in the next section.

5.8 Negative aspects about E-learning for academics

The literature review uncovered that many of the common issues surrounding academics accessing and using E-learning and its associated technology persist today and remain difficult to resolve. In all academic focus groups, participants were very willing to share their experiences and issues they encountered whilst engaging with E-learning and its associated technology. The seven most commonly discussed negative aspects, as stated in the introduction to Part B of this chapter, were: “Lack of teaching resources”; “University technology out of date”; “Lack of time”; “Frustration”; “Resistance”; “Deep and surface learning”; and “Equity associated with E-learning technology”.

5.8.1 Lack of teaching resources

At the time the focus groups were conducted, the participating university was involved in a program of upgrading the E-learning and associated technology facilities in the classrooms across the campus. However, the lack of appropriate computer technology was inhibiting academics who wanted to provide important consistency with their topic content delivery. A main concern was lack of electronic teaching resources in many of the classrooms, or out of date technology where it was available. The type of teaching resources academics expected to use included an internet-connected desktop computer connected to an overhead electronic projector with an audio speaker system in every classroom where teaching took place. Academics had no control over which classrooms were allocated for the topic they were coordinating due to a centrally controlled timetabling system. The undergraduate topics in the participating school of Nursing and Midwifery had on campus enrolments of over 400 students, resulting in each topic requiring multiple classrooms simultaneously across the week. While some classrooms were fully equipped with the required computer technology for teaching, others were equipped with only a white board and overhead projector. Academics strongly indicated that the educational computer technology resources available within the classrooms were inadequate, hampering their ability to be innovative in their teaching.

Academics were frustrated by the obstacles they needed to overcome every day to deliver equitable teaching across their topics, for example:

> Academic 25: *... the infrastructure and the technology, like into a lecture theatre for thirty people and there’s not even a data projector and you have to bring your own laptop is just ridiculous* (FGA5).

One strategy the school put in place to assist in overcoming the lack of properly equipped classrooms was to purchase two large trolleys filled with the audio visual equipment a teacher may need to use in their classroom. However, the weight of all the equipment meant the trolleys were heavy and difficult to manoeuvre. There was a school-based booking system to manage trolley usage but with over 1200 students on campus, the trolleys were often unavailable. This lack of resources caused a high level of frustration amongst many of the academic participants. As one expressed:

> Academic 8: *… going to classrooms where there are still chalk boards and there isn't a computer, so we can write our curriculums to teach students how to look and go and access stuff even within our teaching, to be able to model some of the stuff that we want to but having to physically drag stuff* [one of two heavy mobile media trolleys] *around and set it up, that's if you can get it in there or if it hasn't already been booked out, or trying to set it up for your whole teaching team to allow for the creativity ... and I know that they say they're addressing it but I've been here for three and a half, four years now and it hasn't changed* (FGA2).

As a result of the lack of appropriate classroom teaching technology, the same academic purchased their own laptop computer and electronic projector so they could use them in the rooms that were ill-equipped:

> Academic 8: *And when I first started here I went and bought my own data projector just so that I'd have one and took my own computer in and would drag that around, but the cost of that was actually two and a half grand at my own expense. I mean if people are really committed they'll do it anyway but if you're talking about, most people can't afford that …* (FGA2).

> Academic 9: *And they shouldn't have to* [buy your own classroom media equipment], *it should be a tool of the trade* (FGA2).

> Academic 10: *And you're right, the extra 15 minutes to set up a data projector and that or to get the "dalek"* [movable classroom media equipment] *up, you would do that 10 minutes beforehand* (FGA2).

> Academic 6: *It's such a dampener because there you are, you've got to this effort and there just isn't the facilities there to accommodate this effort that you've made* (FGA2).

One academic who had only commenced employment with the school in the last six months refused to use the mobile media trolleys because they were too big and heavy for her to manage, and she inferred it was a work health and safety issue:

> Academic 12: *That's another thing, the trolleys* [mobile classroom media equipment]*, I don't use them, I think they're really big and cumbersome so I would like to know how much it would cost to buy two of those trolleys, have you seen them, they're called "daleks" and what they are is that if you haven't got a projector or a computer in your room, you can book one of these trolleys and you take them, they're this big, they're huge* (FGA4).

The following academics' comments provide additional evidence to support the same views about the lack of appropriate classroom teaching technology:

> Academic 13: *One of the issues I have is I think the lack of availability of resources, electronic resources in many of our classrooms; it's hard to plan if you plan to do a PowerPoint™in a particular topic and you have one class where you have facilities and several other classes where you haven't, so you've almost got to plan for the lowest*

common denominator. Or the [Overhead] *projectors around the place don't work, some of the trolleys the wheels have fallen off, and you've got to actually carry them and drag them and things like that. That's a concern, it makes it hard to use what technology there is* (FGA3).

Academic 12: *It would be nice if we had more equipment that was updated and current that made it easier to actually use the resources that are available …* (FGA3).

Academic 14: *Another one is the equipment or lack of equipment has to be working and when we talk about E-learning* (FGA4).

It was not just in the classrooms where academics said the computer technology was out of date but also in academics' offices, as evidenced by the following comment about the lack of up to date equipment in their office to undertake teleconferences:

Academic 13: *Well that brings it back then, looking at the equipment I have in my office, for example, I can't teleconference so I would have to book at a separate room, I can't videoconference in my office, I have to book a separate room, even though if I'm at home I can use SKYPE™ and it's beautiful* (FGA3).

Academic participants pointed out that to take full advantage of E-learning, the school needed to invest in classroom technology upgrades:

Academic 8: *So the school needs to be updated and we need to have at least, and I think that's one of the really big issues with E-learning, is actually to set it up properly is expensive and that includes in every classroom, it needs to be in every classroom* (FGA2).

Academic 14: *But I think that's the point, it's the consistency of resources, I mean we've all got whiteboards, we've all got overheads, those projectors, but the consistency of the technology is really limiting in the way you shape your approach to it* (FGA3).

As a consequence of the limited E-learning and associated technology in many of the classrooms, one academic explained how they decided not to use a previously prepared electronic teaching resource because the classroom allocated did not have the appropriate teaching equipment installed:

Academic 15*: I think that having that technology in every single classroom is a key to this because if it's there you use it, like I think twice now if I have to go down and lug all that stuff on my shoulders up to a classroom, it just really annoys me and I think I'll do it without PowerPoint™. And the other thing we need is a wireless network, every single place* [classroom] *so that we can go online and say, "Right, we're going to watch this YouTube™ of someone putting a nasogastric tube down and then we can talk about it"* (FGA3).

One academic tried to overcome the obstacle of ill equipped classrooms by taking their own computer and projector. However, the lack of audio speakers limited the academic's own technology value in a class of 30 students because without appropriate speakers students were unable to hear the audio associated with the media resources being used:

Academic 7: *And then you need the data projector to go with it* [your laptop] *so you don't have thirty of them all crammed around the tiny little speakers, so you can hear it* (FGA2).

Academic 16: *Yes, the* [lack of] *speakers* [in the classroom] *is a bit of an issue and then*

> *you've got to lug the speakers around, I mean … some of the videos you're forced to use because it is the only thing, it's not actually something that's on YouTube*™ (FGA3).

Yet another academic tried to work around the many limitations presented to them because of the lack of appropriate teaching technology in order to provide creative resources to engage their students:

> Academic 20*: The problem is when I download the YouTube™ we don't have the software to present it through our school computer so I use my laptop in the tutorial because I download the program and the software as well* (FGA4).

> Academic 19: *And that's one of the really big problems is because YouTube™is fantastic, there are so many things on and I must admit I got quite a kick out of my second year patho* [pathophysiology] *class, … but we* [the university] *don't have the software shared so we can download it and actually embed it into a PowerPoint*™ (FGA4).

The focus groups also discussed the move from paper-based to electronic marking. One academic commented that in order to take full advantage of electronic marking, academics should be supplied with a laptop computer:

> Academic 21*: You need it* [Online marking] *to be portable though, I think we all need a laptop, all academics have a laptop, and that means we would then be portable and all of those issues that have come up with being able to download assignments and take them home and still mark them; you could do that on your laptop* (FGA4).

While some mention of out of date technology was made in academics' discussion of the lack of teaching resources, academics discussed issues related to the wider university out of date computer infrastructure they encountered as they tried to complete their work related to topic administration.

5.8.2 University technology out of date

It is acknowledged that the rapid rate of change that accompanies digital technology means those education institutions will trail behind in offering the next new innovation. While many academics are keen to use electronic technology to enhance their teaching, as evidenced in the previous sub-theme, they also want to work together. At the time of this research, the participating university's computer systems were unable to offer a number of innovative aspects academics were keen to use, leading to academics venting their frustration:

> Academic 3: *So this university has to nut out the bugs and really work at it or not. And the other thing that's also involved is if you want academics to work better then everyone needs to have some sort of calendar system like O* [brand], *but not MM* [brand], *which has got to be one of the clunkiest things I've ever encountered. …. well anything so that we can in fact work together and seeing that ... We're in the dark ages still at the moment ...* (FGA1).

> Academic 2: *We're also dealing with a lot of old stuff …* (FGA1).

> Academic 4: … *we also use what is now coming in known as the* [brand], *and that has to be one of the most old fashioned time wasting devices that I've ever used* (FGA1).

Academic 2*: I agree* (FGA1).

One academic described how, in order to use various university computer systems, they had to use at least two web browsers to enable the programs to work properly:

> Academic 20: *M's brought up a good point, Explorer™ is good for LMS but Mozilla™ is better for Student 2* [University student record system], *for downloading class lists, you can't do it in Explorer™ so you need to open Mozilla™, so you need to have two web browsers basically, so lots of technical glitches as well as conforming to systems with two different systems* (FGA4).

The same academic identified yet another issue; they were unable to carry out online marking due to lack of availability of appropriate software:

> Academic 20: *We can translate the Word document into a PDF by downloading the software but that software doesn't support the marking on the PDF so that's a big problem and the university, we sent an email to the university IT staff and they said that at the moment we couldn't download the software we use on campus in our home computers so we couldn't mark through the PDF, even if we can transform the document from the Word document to PDF* (FGA4).

> Academic 21: *So you have to change your way of operating, not because it's good or because it's better or it's educationally sound, but because we have this software and the software accepts lists and not something else* (FGA4).

Some academics knew that the university had limitations with their current IT infrastructure and shared this with their group:

> Academic 8*: From what I understand talking to the people up the hill [*university Information computer services*], it's actually problematic in terms of up there and the space that's been given to running it, so that's why it crashes a bit, so maybe that's one of the other issues that we've got is that while we need to be keeping up with this sometimes it's not as well supported and I don't mean that from the people involved, I mean from an infrastructure place, capacity* (FGA2).

One academic was aware of the potential of automated forms to enable online completion and commented on how old some of the university forms were:

> Academic 13: *I think a lot of these systems, talking about enrolment and what have you, they're so antiquated, they're very cumbersome to use, you're looking at that whole timetable business and even things like filling in ethics applications, for example that PDF my son could design it better, they're so old* (FGA3).

Academics held online tutorials with students. The school provided them with web cameras that could be mounted on their office desktop computers to assist with this, but the academics discussed how they were unable to effectively use the cameras because of the university's limited computer infrastructure capacity. The limited capacity caused the university's secure intranet to slow down to the point that the live video streamed through the web cameras would freeze, necessitating academics to refresh the screen. However, as one academic explained, this resulted in the students and the staff member being logged out of the session:

> Academic 18: *One of the things we've learnt over the last eighteen months is we say, "Don't*

> *bother getting a camera* [Web camera on desktop computer] *because the camera slows down LMS Live"* [not enough internet band width for the technology being used] (FGA4).

The movement toward the use of more and more electronic formats involving teaching and administration meant academic participants spent increasing amounts of their time engaging with ICT; time that the school's management did not acknowledge fully when allocating staff workloads.

5.8.3 Lack of time

One participant expressed concern that the movement to more and more electronic work and teaching formats had resulted in an increased administrative workload for academics:

> Academic 14: *Getting emails has meant we* [academics] *do more administrative stuff; getting any electronic innovation has meant vastly more administrative stuff for the people who are supposed to be doing teaching and research. We're not supposed to be doing heaps of admin; grades and things like that fine, a bit of admin stuff but it shouldn't be the vast amount of work, especially the big topics* (FGA3).

Some of the changes brought about by moving to an electronic assignment format meant that many administrative functions carried out previously by school administrative support staff had now moved directly to the academics:

> Academic 20: *But I agree, hard copy is an extraordinary length of* [administrative] *time but that wasn't on the academics, but now with an electronic submission it is on the academics and it does take time to do all that uploading, saving* (FGA4).

Academics were in favour of the increased flexibility provided by electronic communication with students and other staff. However, they were concerned about an accompanying increased time factor and the need to respond within 24 hours:

> Academic 20: *I agree, email is good, however I would spend at least two hours a day on email, so there's the time factor associated with that* (FGA4).

> Academic 4: *My main issue is the time I spend answering emails because my emails come to my email address through the university; they* [emails] *come through the LMS, they* [emails] *come through discussion forums on LMS and that's actually three times the amount. Then you have large classes, none of 100 or 200 but 400 and 450, and they tend to come at about 30-40 a day and that's a lot of time spent answering emails. ... I think the time wasted, I say "wasted", that I spend returning and answering emails would constitute about three days a week. Now of a normal seven and a half hour working day, and obviously I never work seven and a half hours because there's more to do, it's an enormous amount of work* (FGA1).

> Academic 6: *But it's that we've got that many* [emails], *when you coordinate a topic with 400 students and even if only half of them are emailing me about something, it takes a lot of time* (FGA4).

The researcher noted that academic participants felt there was a lack of acknowledgement in the academic workload model used in the school when considering the impact of the increasing amount of work being carried out electronically:

> Academic 12: *Ten points in a year* [Workload calculation allocated 400 points per year for full time academic] *to topic coordinator, perhaps 20 if you have over 150 students if you're lucky, so that equates to not even an hour a week by the semester, but if you answer five emails and by the time you answer them and the student writes back and I forgot to ask you this, then that's increased that, so your whole topic coordinating for a week has gone on answering a few emails or checking LMS, so then you don't get to update your study plan or workbook or mark anything because that's it, topic coordinator's done if we work to rule, but we don't. All this electronic stuff has increased that workload as well …* (FGA3).

Time was also a factor in the development of online teaching resources and academic skill development. One academic explained that in order to develop online resources, the school needed to invest in appropriately qualified and skilled staff, and to recognise the need to make time available in academics' workloads to assist in the development of these specialised teaching resources:

> Academic 5: … *find ways of being innovative, to my mind it's got to come in one of two ways; it's either going to free up the coordinators to go and do that or pay somebody as you were suggesting before, either individuals who are very good at it or actually have them in the flexible delivery unit to be available for that activity. If you're trying to do it on top of everything else, you've got very limited opportunity* (FGA1).

Academics were willing to work and develop teaching resources but felt the school lacked the resources to do so, and that academics did not have the capacity or the time in their current workload allocation:

> Academic 6: *I would like to but the technology is not available and the resource factor; the people* [educational technologist] *resource factor and the time that you need to develop these things* (FGA3).

> Academic 2*: It's not only the fact that we haven't been exposed to many of these things before, it's also the fact we haven't been given time or resources, which includes resources for a web designer, those sort of bits and pieces, you know, the information to do it. I think we've got the potential to go further and we've got the ideas to go further but we're not allocated any time to develop E-learning* (FGA1).

> Academic 12: *we've spoken that it takes time, it takes more time to prepare LMS Live and those sorts of things but there doesn't seem to be currently, and we're all encouraged to do it but there doesn't seem to be any capacity within the workload or any acknowledgement of preparation of resources, or that once these resources are prepared that there is maintenance that is ongoing in order for it to be as useful as possible* (FGA3).

> Academic 13: *My understanding of E-learning, if you want to deal with it appropriately and properly, it takes at least twice as much time as classroom learning and you cannot be given unlimited amounts of students unless either strategies are put in place that facilitate larger numbers, and that has implications of teaching methods and processes that we use, or just recognition that it's the same number of students you can deal with without blowing your workload to pieces* (FGA3).

The rapid rate at which computer technology is constantly updated was also a concern for academics' confidence, and their need to keep up and use emerging technologies:

> Academic 7: *I think a significant one is to maintain the confidence to keep up with rapidly developing IT situations and developments and all that, and IT seems to be out of date in*

about twelve weeks' time and you have to update software or you have to update the hardware, and that takes time and the confidence to keep up (FGA2).

Academic 16: *The LMS Live has potential but it's time consuming. …. I think we still need the support and acknowledging that it takes time to be able to put materials together to fully utilise it for people* (FGA3).

Academic 15: *If you go to a half-day session* [professional development about E-learning technologies]*, write your whole day off because by the time you get in here* [office], *you do a couple of things, you've got to travel up there* [professional development], *it's a whole day and that's not a bad thing either but it's about the time commitment; it's about what you can possibly reasonably do … I think it comes down to resources, it comes down to money and it comes down to time* (FGA3).

The researcher observed and listened to academics in the focus groups who were trying to move forward with their teaching methods. However, their efforts could not be realised due to the lack of equipment in the classrooms and university computer infrastructure that was struggling to keep up with ICT advances. There was also a lack of acknowledgement by school management of the increased time required of academics to engage in the new electronic format for much of their work. This tension resulted in feelings of frustration experienced by a number of the academics.

5.8.4 Frustration

Academic participants described their frustration that even though some classrooms contained the appropriate technology, the equipment had not been set up in a way that permitted them to use E-learning to provide the best learning opportunities for their students:

Academic 16: *I certainly find it frustrating even using the PowerPoint™ stuff that you then have that* [projecting the image] *in front of the whiteboard* [so the whiteboard is unable to be used as the same time as the projected image]. *Simple things that people* [who authorised where to install the ICT equipment] *haven't thought about in the classrooms* (FGA3).

Another source of frustration was the lack of compatible software programs to facilitate the use of online resources that had been identified by academics in preparation for use in the classroom:

Academic 23: *But I think it's frustrating that I still have to download that snippet onto my USB, plug it in, put it onto the desktop for it all to run correctly ... Then again it excites me that I can do that but then it's also the limitations of my own knowledge, but also the limitations of the technology they have here as well* (FGA5).

In face-to-face classroom situations, some academics became frustrated when students used their mobile devices in class. These academics felt the students were disrupting the lesson flow and hindering group discussion by making themselves unavailable behind their laptops:

Academic 20: *… but it's frustrating when they're sitting there playing on their phones because sometimes now with the new iPhone™, you actually don't know if they're actually looking at applications that are suitable or if they're on Facebook™, and so you kind of sit there thinking, "I don't actually want to turn all that off because that can actually come in*

> *really good looking up drugs and stuff like that when it's part of your group work", but then it's like how do you monitor that? And so it's kind of that fine line of using it but then the students not abusing it.* (FGA4).

> Academic 9: *… I expect people* [students] *to come with some knowledge so that they can discuss things and I've quite often seen students flip up the laptop to find an answer within a discussion, whereas I think sometimes it does stifle, they think it's easier, "We'll just find the answer here" ... I think that stifles their own learning capacity, their own creativity and that's when it frustrates me* (FGA2).

The level of skill and preparation for teaching undertaken by fellow academics associated with using E-learning technologies in the classroom was also a source of frustration. However, on reflection, one academic realised that it was not just having the technology in the classroom that was an issue; it was also the academics having the confidence to use the technology:

> Academic 10: *… clearly they* [a fellow academic] *hadn't prepared themselves for the technology, even though the technology was there and that used to frustrate me. So we've got to do the technology but people have to have the confidence to do that* (FGA2).

Some academics were frustrated that the university LMS was not as intuitive or user friendly as it could be:

> Academic 19: … *the fact that it* [electronic gradebook] *keeps going back to the beginning is frustrating so I just keep to the 20 per page and remember to do the right one and not do the same page again, but it is frustrating that it then gets stuffed up and you kind of go, "Can you send me your results?", "I've entered them, why can't I just send you the spreadsheet and then merge them all and put them all in?" So yeah, I can understand how it's frustrating when you've got several people doing that* (FGA4).

> Academic 16: *And every time you enter something, it* [electronic gradebook] *actually goes back to the front page, so you're in Z and you're back at the front page and that's fine except when you've got 400 of them and do this a million times a day; its frustrating* (FGA3).

The evidence from the academics' comments shows the academics were caught in a tension that resulted in feelings of frustration. They wanted to engage with E-learning and its associated technology, but impediments such as equipment and software incompatibilities proved to be daily obstacles. Evidence of another sub-theme, Resistance (to learning and using technology), also emerged from the academic focus groups, as discussed in the next section.

5.8.5 Resistance

A number of academic participants expressed their opinions and offered rationale as to why they and their colleagues were experiencing levels of resistance to becoming involved with E-learning and its associated technology. They openly discussed possible reasons for this resistance. One participant was concerned that academics may have low levels of confidence in using E-learning and its associated technology, and that there was little support within the school to address low levels of CIL on a daily basis outside of attending formal professional development sessions:

> Academic 16: *But the other issue of resistance might be just that people don't know how to use a particular piece of technology and they haven't got time, or they think they haven't got time to learn about it, and then they think, "It's too hard to access, no-one's here to help", so it's like these multiple layers of resistance and they're not all conceptual; some of them are just practical about "I can't get help".* … *I feel that I'm always behind the eight ball, so to speak, in terms of technology. I mean, I do get there, but I find that I'm resistant and it's not a conscious resistance, retrospectively it's subconscious but there is some resistance there about getting on board with new stuff, and really someone has to kind of push me. I feel I have to be pushed, the stick has to be there for me to go. I need to get on board with this, so that's an issue for me* (FGA3).

This academic's honesty was supported by others nodding in the focus group, indicating that she was not the only one experiencing this internal conflict.

Another academic did not trust computer systems and felt the need to back up documents in two places to increase their sense of security:

> Academic 20*: ... I don't trust E-Systems, I just don't trust them* [computers]. *I have to save everything three times, if I've got that assignment I'm responsible for that assignment, I want to save it somewhere, probably in two places that I know it's safe so it doesn't get lost* (FGA4).

One academic felt under pressure to keep up with rapidly changing computer technology. Although implying resistance, they said they had "no option" because of the need to keep up with their students:

> Academic 12: *… I'm 40, that I really question sometimes even wanting to keep up but then I have students who come in who are so IT savvy and also E-learning savvy. so you really have to keep up I think* (FGA2).

Another academic who had been teaching using the high fidelity mannequin SimMan® found that the whole concept of this type of immersive learning supported by computer technology was too confronting for some other academics to even attempt:

> Academic 12: *… since I've been doing* SimMan® *for the past two years, there are some TCs* [academics who were Topic Coordinators] *who are exceedingly resistant to this new way of learning, via SimMan® methodology and so forth, and they are quite scared of it.*
>
> Academic 16*: Do they give you a rationale for that fear, like what is the fear about in relation to using that technology?*
>
> Academic 12: *It is far too confronting, so they say, "I don't concur with that at all, and it is also not life like and realistic". It can be very much realistic.*
>
> Academic 16: *But isn't that what it's all about, that's the point of simulation?*
>
> Academic 15: *So it's resistance to change do you think?*
>
> Academic 12: *That too yes, absolutely* (FGA3).

Academics reasoned that some may choose the strategy of avoiding any high fidelity simulation teaching because they feared being exposed publicly as not competent in their role within the school. This avoidance also translated into the topics they coordinated; they did not incorporate any learning activities that would involve high fidelity simulation:

> Academic 16: *… I just feel, I don't know whether it's conceptual resistance because I think there is some conceptual resistance in this whole idea of being publicly…*
>
> Academic 14: *Accountable?*
>
> Academic 16: *Yeah, because you enter the public domain so you go from being privately lecturing in a lecture theatre, to a certain extent private, to potentially being on the internet and that might be conceptually difficult for people* [academics] *to accept* (FGA3).

One academic thought it was important to feel comfortable and to overcome resistance by having the will to seek out professional development related to using E-learning technology:

> Academic 10: *… I think that again it comes back to us getting out of our comfort zone and actually making an effort to go up the hill* [to staff development] *and to see what we need* (FGA2).

The same academic alluded to barriers put in place by some staff members who were resistant to change. Several academics expressed the opinion that some full time academic staff were reluctant to change and adopt any advances in technology, and so were resisting using the technology in their teaching and some administrative work:

> Academic 10: ... *it's the barriers of the full time permanent academic staff who aren't willing to change or who are scared of the technology, that's where I believe the issue is in this school … clearly they hadn't prepared themselves for the technology even though the technology was there … So we've got to do the technology but people have to have the confidence to do that. So I think it's getting used to change and we can feel that we can be threatened* (FGA2).
>
> Academic 15: *I mean, there are clearly people* [academics] *that really don't want to engage with it* [E-learning and associated technology] *and you can't make them; you can take a horse to water but you can't make it drink* (FGA3).
>
> Academic 21*: The reality is it's alright to talk about all the things that are possible, we know what is possible but that makes an assumption that you've got people that want, and know how. and are willing to engage in it and use it … I don't use LMS Live at all and I don't intend to unless the school sets up distance education in that sort of way. People need to have a choice; they can't be told they must do something in a certain way* (FGA4).
>
> *Academic 18: I think we're burying our heads in the sand if we think that we should not be engaging in this Metacognition* [E-learning and associated computer information technology] *of how you communicate with the broader world* (FGA4).
>
> Academic 18: *Don't you do it* [enter marks] *by LMS, Gradebook which is in LMS?*
>
> *Academic 21: I don't* (FGA4).

The comments above provide evidence that some academics more than others embraced the move to electronic work formats, and give the rationale behind the different levels of resistance to using E-learning and its associated technology. Academics were keenly aware that rapid access to online information did not necessarily equate with deep learning; an issue discussed in the next sub-theme.

5.8.6 Depth of student learning

Deep learning is said to occur when the student achieves a level of comprehension, and the ability to order the significance of the new information and to integrate that information into his/her existing level of knowledge (Garrison 2011). Participants discussed how the pedagogy associated with E-learning needed to be designed to encourage deep learning and overcome the academics' thoughts that students were using online resources to collect information instead of reading the information and analysing the information:

> Academic 4: *That is a huge problem with having anything with E-learning in that they don't see the text, they don't want to learn, they have no knowledge, the little knowledge that they have they think that they know it all* … (FGA1).

> Academic 24: *That very much goes back to the ways of learning. And it's very much a generational thing as well, the ways of learning are changing through the generations that with Gen Y or Z or I* [students are], *but they're used to learning from technology, from seeing little bits flash towards them; they're not used to sitting and reading a book* … (FGA5).

> Academic 16: *Part of this is that they* [students] *believe that everything should be given to them and that's not supposed to be as negative as it sounds. They're used to information being given to them straight away is what I'm saying … they don't like doing it* [reading] *because it's not instantaneous* (FGA3).

One academic questioned whether any sort of learning occurred when students just accessed blocks of text from the internet:

> Academic 7: *Do we think that E-learning actually helps the student? As it was twenty years ago, it wasn't there. Does it actually help them now in … deep thinking?* (FGA2).

The same academic was also concerned that students were not willing to engage in the processes required to achieve deep learning because they thought they could access the information from the internet when they needed it:

> Academic 7: *E-learning also, after last year, last semester completing one of those sets, I really came to a strong conclusion that E-learning also allows students to negate the onus to retain information and they also loathe reading chapters now. They'll ask a question and I'll say, "Chapter X, page X, Y, Z" and they go, "Oh dear you mean I have to read the book?" and I go, "Yes, it is something you do in some of them", and they don't like that, they wanted everything hinted in terms of the exam content. They don't want to retain that because it's all up on their screen* (FGA2).

One academic expressed concern that online learning did not encourage students to think for themselves; instead they just accessed information form the internet without critique:

> Academic 9: *Someone* [a participant from the group] *said it's easier for them, it's quicker, it's easier, they just look it up and I find some students are doing that when what I'm after from them is a discussion ... their own thinking based on the knowledge that they already have* (FGA2).

In keeping with this, another academic thought the face-to-face classroom was perhaps the only place where an academic could control the amount of student distraction, such as accessing mobile learning devices:

> Academic 14: *The* [face-to-face] *classroom is probably the only place that is controlled for that sort of thing* [deep engagement with learning], *I mean unless they're allowed to answer their phone and play on their computer in the classroom they are engaged with the classroom, and if we can teach effectively to that* [encouraging deep learning] *... (FGA3).*

The same academic was aware that when a student's working memory reached capacity they became overwhelmed with too much online information and their ability to learn decreased:

> Academic 14: *But the evidence is showing that in actual fact they're not learning stuff when they do that. The thing is that they are showing that this sort of overwhelming deluge of information is not necessarily transferring into knowledge and education, which means change of behaviours* … (FGA3).

Further, several academics discussed whether looking up information was learning:

> Academic 10: *I have a feeling sometimes that with some students they learn less because it's easier to access anything, because it's easier to access and they can maybe write down, say they're writing an assignment of two to three thousand words and then they're accessing blocks of this and blocks of that and blocks of that which is not, they might be technically plagiarising, but it's hard to pick* …
>
> *I'm just thinking that that's a certain, I suppose it depends on what you consider is their learning in a way, and if their learning now is access to information like that, which is what the world is like, is that that's how they're getting their information anyway* (FGA2).
>
> Academic 8: *Is that really learning or is that looking up information?* (FGA2).
>
> Academic 10: *That was my question. I don't have the answer to that because everyone is a little bit different. … I think it goes back to your point about designing your assessment to ensure that they have some knowledge and whether that needs to apply it to their own person or their own health care or whatever, and that's sometimes difficult to do in some topics, but to design your assessment, whether it's E-learning or whether it's not, to believe that they have learnt what they're supposed to in that particular topic* (FGA2).

Another academic thought that students who come directly from secondary schooling were inadequately prepared for commencing their tertiary studies and giving the example of poor spelling skills:

> Academic 8: *That's exactly what they're doing in teaching in the schools. Why do the students need to spell correctly,*[when] *there's a spell checker* [in the computer program]*?* (FGA2).

Constructing online assessments that require students to critique online information and apply aspects of that information to learning scenarios was suggested as one way to encourage deep learning:

> Academic 3: *So that's when you have the scenario base and say, "Okay you've got someone that comes in and they've got a fractured tib and fib* [tibia and fibula], *what are you going to do about it?" "Oh just hang on, I'll go look it up in the book". "Well no you can't do that, what are you going to do about it?" So you have to have stuff [*simulation*] that gives them reality and makes them realise they can't say, "I'll go look it up" (FGA1).*

An academic agreed that high fidelity simulation scenarios developed to promote critical thinking and clinical reasoning was an effective way to allow students to link their theory and practice together, thus achieving deep learning:

> Academic 2: *It's like* SimMan®*, it's the message you're trying to get through, what you think they'll remember and it does, and we haven't proved it yet but students are now giving examples in practice to their facilitator, "Oh I did this, I know this because...", and they're relating it back to* SimMan® *because there was one trigger that they'll never, ever forget and that's the trigger we have to find in constructing E-learning* (FGA1).

The issue of academic integrity and students creating work in the online learning environment was also a concern raised by one academic:

> Academic 12: *The other thing with the online assignment submitting is how much of the work is actually their own, that academic integrity, because if it's submitted to someone and they're marking it and they're actually reading it and they might have five students in their class that all hand in the same thing, you kind of go, "Hang on a minute, what's going on here?" because I know from this semester I got C's marking and marked an assignment and went, "I've read this one before", and word for word read these two students' assignments; they were in different tut groups and they'd copied each other word for word, which is really stupid when you're nearly finished your degree* (FGA3).

Another academic from the same focus group described how students needed to develop responsibility when accessing information in the online learning environment, and use the information without breaching academic integrity guidelines:

> Academic 16: *So that way they develop, just from what I'm hearing students haven't developed responsibility. What is responsibility and how you develop responsibility and behavioural responsibility and all that sort of stuff? And the not being able to integrate knowledge and information is part of that because responsibility I think develops over time* (FGA3).

Academics readily discussed the risks and benefits that E-learning and its associated technology affords students as they undertake their university studies. Some participants questioned the value of being able to access so much information if that information was not incorporated into the students' learning. While questioning students' level of integrity in using information technology, some academics also questioned the issue of equity associated with E-learning technology.

5.8.7 Equity associated with E-learning technology

In this final sub-theme, academics discussed the importance of equitable access to learning resources across the student group. Academics were keenly aware that there were varying levels of CIL within the student cohort and that as academics, they needed to factor this into the online learning resources they developed. Academics realised that to facilitate learning they needed to accommodate not only a variety of learning styles but also a varied level of CIL amongst the students they were educating, for example:

> Academic 9: ... *we have to be conscious that we're providing equitable education for all at the same level and if there are varying capacities* [student information literacy] *out there then that might stifle our ability to provide one particular learning mode* (FGA2).

> Academic 8: *I think that raises another issue because we have students from the IT savvy to the complete no idea, so when you're incorporating E-learning and E-learning things they need to have, the ones that have no idea about computers and may not even have had a computer before need some place to be able to get the knowledge to be able to navigate that stuff, otherwise they get left behind. There is a lot of assumed knowledge now but because of our mature age students I think it's not as assumed as we make it* (FGA2).

The same academic thought that using blended learning education methodologies where students experienced both face-to-face classroom teaching and online learning was more equitable:

> Academic 8: *And so from an equity perspective, that makes it more equitable because if you can do classroom teaching with what you're doing on the internet, it does give them the capacity for question and answer* (FGA2).

Academics were concerned there were no formal programs in the school or the university to address the varying levels of student CIL in all undergraduate Bachelor of Nursing program pathways:

> Academic 7: *… for an undergraduate student, it might be quite easy for them to get on a computer and find whatever they're looking for because they've grown up with computers, but maybe for some of our other students who haven't, what kind of additional support has the university got for them to teach them about all this e-technology?* (FGA3).

One academic was concerned that students were paying to attend university classes on campus and not to sit in front of a computer screen. They felt that offering a variety of content delivery in the form of blended learning was more equitable:

> Academic 15*: I think one of the other issues that relates to E-learning is that we can't just go electronic. I think these students are paying good money to be at uni and I don't think that everything should be electronic. I think we actually need to have a variety, and I think within topics we need to have that variety so that if people want to come they can* (FGA3).

Another academic considered it an issue that E-learning was more accessible to those students who had the finances and lived within high speed internet coverage areas. This put them at a distinct advantage over students who did not; a concern echoed by an academic in a different focus group:

> Academic 7: *Do you think that E-learning is perhaps easier, more accessible to those who have the funds to purchase all the hardware to be able to keep up with developments and all the rest of it. Even location as well; in the country they may have only dial up rather than us here in the city having nice whiz bang broadband and all that* (FGA2).

> Academic 16: *There seems to me to be a diversity of needs and capacities around E-learning and that as academics we can't assume what the students have in their capacity, and I think ... issues of socio-economic status also impact on students' capacity, and I guess their needs are as various as they are diverse as a cohort, aren't they* (FGA3)?

Students, like academics, needed the most up to date equipment to engage with synchronous online delivery methods. The students required funds to purchase the required equipment.

However, academics discussed the view that this type of online delivery would not be effective for the large cohort of undergraduate students:

> Academic 20: *But at the other end the students also need* [to have purchased and know how to use the web camera and headset microphone] *the camcorder and the microphone, and that's an issue. But it's okay for small groups but when you get big groups, undergraduate groups of 400, 500 students, how can you possibly do LMS Live without taking two weeks to do every session with a small number of students? It's just impossible* (FGA4).

5.8.8 Summary of the theme "Negative aspects about E-learning for academics"

Participants identified a number of negative aspects associated with E-learning over which they had little control. These included the lack of teaching resources and working with out-dated equipment. These limitations led academics to express frustration at being unable to implement the E-learning resources they had developed. Other academics explained how they did not want to use E-learning because of these limitations. Another negative aspect identified during the focus groups was the depth of learning students achieved when using E-learning. The final negative aspect discussed by academics was the lack of equity that existed students when used E-learning. They discussed how not all students had access to reliable fast internet services nor did they have the required ICT to use E-learning.

The final academic theme found in all academic focus groups was the need for appropriate, accessible and timely Professional development related to the different types of classroom computer technology and the administrative programs that were used to record and track students within the topics. This is discussed in the next section.

5.9 Professional development

The university provided professional development courses in large group format for all university staff. While staff could book and attend sessions that were broad in nature and provided basic information, the researcher found that these sessions did not meet the needs of many of the academic participants. The sessions' general nature, lack of ability to immediately incorporate what was learnt into everyday work and the pressure to add another task to an already full workload were some of the reasons given as to why the academics did not attend sessions.

Academics expressed concern about their ability to retain the newly learnt knowledge and skills, in addition to the confidence required to effectively use classroom equipment and the features of the LMS if they did not use the equipment constantly. Some academics taught in one semester then undertook research in the next semester, resulting in a sharp decrease in their skill and confidence levels associated with classroom technology and features of the LMS.

An academic pointed out that even with the computer technology, not all academics in the school had the skills to use it:

> Academic 16: *And it's about planning yourself as well, you can't make the assumption that everybody's got the technological savvy that they need to be able to do that, so you need to have time to be able to explore that, and how does professional development build into your workload* (FGA3).

Several academics expressed their concerns about the lack of support offered by the school for teaching in the online environment. While recognising that they were not computer experts, they felt pressured to be computer experts for the students at the same time as being content experts:

> Academic 19: *And in reality, as much as you've got 50 minutes, you'll probably get through about 35 minutes of stuff that you want to cover because you've got to do all that trouble-shooting or then you kind of go off on tangents, which happens anyway in classrooms. You've got to do all that other stuff, which is like "Which hat am I wearing at the moment? Text hat, IT hat, teacher hat?"* (FGA4).

> Academic 10: … *LMS Live* [synchronistic online tutorial] *... if things stuff up or if we don't have the answers or if we can't provide the right information, then it is a little bit tricky. We have methods to get around that, but still it's a challenge and if you're not used to the technology it's a high challenge. ... I think, "Yes we do need assistance with that because that's not our expertise", and as we get further expertise it would be good but I think that will always be the case and I think we do need people who that's their job is to assist us with that* (FGA2).

At the time of the study, the academics did not think the professional development offered by the university met their requirements:

> Academic 15: *But it's also appropriate professional development. I mean the program doesn't offer us anything specifically for helping us with what we need* (FGA3).

The way academic workloads were sometimes configured meant that some academics did not retain high level computer and learning management system skills if they did not use them continually throughout the academic year:

> Academic 18: *I haven't used LMS since last semester. I'm thinking if I want to use it again for Honours, which I'd love to, I think I have to learn how to drive it again* (FGA4).

> Academic 19*: Well that's it, I'm teaching LMS Live for third years and I'm sitting there going over last year's thinking, "How do I do this again?" And I've got to go through and actually re-do it all again and now instead of six people I've supposedly got 20, but we'll see how many rock up* [turn up for class] (FGA4).

One academic suggested that unless academics were going to use the computer technology immediately following the professional development session, it was pointless because what was learnt would not be retained:

> Academic 15: *So until you're actually ready to do it, it's pointless doing that* [attending professional development], *but as far as I'm concerned if you have a look back they do have the courses up there in my opinion but you would be obviously looking at them deeper than I would be, so maybe you may need to make some recommendations to them about courses that need to be put on for staff, but it's about finding the time to be able to go to that as well*

> (FGA3).

This sentiment was also expressed in the other focus groups, for example:

> Academic 19: *And one of the hardest parts for academics is a) knowing what's out there, getting trained up and doing it, getting trained up and then not using it for twelve months because it's not in a topic, and then by the time ... "Oh, my topic, we're going to use this", I need more training* (FGA4).

> Academic 23*: And then the other side of it is keeping up with it, like I went* [to undertake professional development] *and did the blogg thing last year, I went and did the … last year, that was great but I haven't really had time to really practice it and use it…*(FGA5).

One academic, in their role as Topic Coordinator, organised targeted professional development to equip academics in the topic teaching team with the required knowledge and skills to effectively deliver the topic content and undertake the topic administration. The academic found this type of professional development was very effective at meeting the needs of the teaching team members:

> Academic 25: *… we invited her* [staff member from university information computer services] *into our meeting and gave all the tutors half hour* [professional development] *instructions. It's easier, we looked at the computer access, the internet access, so she demonstrated how to go through that, including the students; how we can instruct the students to upload and how we download, and how we create the photo and the seven day, safe day Safe Assignments, and how to mark it* (FGA5).

Having school-wide agreement about the professional development required to assist academics was seen as useful for creating a degree of consistency:

> Academic 21: *I guess training for academics so they know what they're doing and having perhaps an agreed system faculty wide so that everybody is using something that is consistent … and that people are trained appropriately to use it* (FGA4).

One academic thought that if the educational technology was introduced appropriately, academics would have the required skills to become competent technology users:

> Academic 2: *Maybe the young ones coming up will have more idea but I still think we've got the potential to be able to adapt. I don't think that's a problem ultimately if we're exposed gradually to each component* (FGA1).

Another academic described how E-learning pedagogy is different from face-to-face classroom pedagogy and that academics cannot be expected to move between two environments without adequate professional development:

> Academic 16: *One thing that I would like more if I'm going to be involved in E-learning more is to learn more about it because it's a very different style of teaching. You can't just transfer what's in the study guide in print onto E-learning if you're going to deliver it specifically online and I think staff need to be educated in it if we're going to make a move towards that sort of thing. …you need to have time to be able to explore* [E-learning] *that and how does professional development build into your workload* (FGA3).

At the time of the focus groups, the university had one dedicated educational technologist available to assist academics across the whole campus to use LMS Live; a ratio of 1 to 1000.

Academics were accessing the professional development provided by the university but one commented that attending one or two sessions about incorporating a new piece of computer technology did not mean they were confident or ready to use that technology in the classroom. Another academic felt the professional development was too inaccessible:

> Academic 15: *… I've been to two sessions up the hill, professional development sessions but I don't feel confident enough to do it myself so it's about having that support and knowing that you've got that support. I know C says that he will come and do it but if he's doing it for 4000 people in a uni, it's a big ask* (FGA3).

> Academic 4: *... it* [professional development sessions] *seems also to be so inaccessible … to actually just take the weight of anxiety off us* (FGA1).

Academics wanted specific professional development to increase their own levels of CIL to enable them to use equipment with confidence in their teaching and to pass their skills on to students.

5.9.1 Summary of the theme 'Professional development'

The final theme related to the professional development (PD) available to academics and how these sessions were not meeting their needs. They tried to use software as requested to by the school administration however the wider university ICT systems could not support this software. Respondents also discussed how they were frustrated by the lack of time to put into practice what they had learnt during the PD session.

5.10 Summary

The findings from Phase 1 focus groups of this mixed methods study provide evidence of the students' experiences of, and concerns about, E-learning and its associated technology. The theme "Positive about aspects of E-learning and its associated technology" revealed flexibility of studying, access to learning materials and contact with other students enhanced learning for some students. The theme "Negative about aspects of E-learning and its associated technology" revealed frustration, fear and low levels of CIL skills hampered learning for some students.

The findings from Phase 1 academic focus groups provide evidence of the participating academics' experiences of, and concerns about, E-learning and its associated technology. This phase revealed three main themes: "Positive about aspects of E-learning and its associated technology"; "Negative aspects about E-learning for academics"; and "Professional development". Major concerns expressed by the academics were: lack of teaching resources; out of date technology; time pressures; frustration trying to keep up with technology and gain enough support to use it effectively; resistance to adopting E-learning; the depth of student learning when using new technology; equity of student access to E-learning technology; and sometimes inaccessible, ineffective and unsupported professional development for assisting academics to keep up to date with technology and develop E-learning programs.

The researcher used the themes from the student and academic focus groups to develop two questionnaires that were used to collect the Phase 2 quantitative data from schools of Nursing and Midwifery based in universities across Australia. The development and validation processes undertaken for the two questionnaires are discussed in the next chapter.

Chapter 6 Development of the Two Questionnaires

6.1 Introduction

The focus of this chapter is on the development of the student and academic questionnaires used in this study. It includes a review of existing survey instruments located in the literature between 2005 and 2010, and examines their suitability. The development of scales used in the student and academic questionnaires is then discussed. The processes to demonstrate validity and reliability are explained. The final section of this chapter details the exploratory factor analysis used for both questionnaires to identify patterns and possible correlations between respondents' data.

6.2 Development of the two questionnaires

Based on the literature review and the findings from Phase 1 of this study, the following issues were identified as potentially impacting on student and academic perceptions, and use of E-learning and its associated technology.

6.2.1 Identified *student* issues with E-learning

The literature and Phase 1 of the study identified five positive aspects of E-learning for students:

- Flexibility
- Perceived improved learning
- Improved access to resources (online)
- Connection with other students
- Communication with academic staff.

Both sources also identified four negative issues for students associated with E-learning.

- Computer information literacy (CIL) skills for students were low
- Frustration using E-learning and associated technology
- Lack of ICT technical support, including access to the internet
- Students wanted to keep face-to-face teaching.

6.2.2 Identified *academic* issues with E-learning

The literature and Phase 1 of the study identified four positive aspects of E-learning for academics:

- The ability to plan their teaching for the entire semester
- Being able to organise all of their online supporting resources
- Accommodating students' learning styles

- The potential to be innovative with online resources.

Negative issues associated with E-learning were also identified for academics. Based on the literature, six concerns were highlighted:

- Lack of effective professional development
- Lack of technical ICT support
- Lack of incentives to use E-learning
- Quality of the Learning Management system (LMS)
    - Functionality
    - Interaction speed
- Lack of time to learn to integrate and develop E-learning into current teaching practice
- Lack of evidence of pedagogical success with E-learning.

In addition to the problems located in the literature, five additional issues were identified from the Phase 1 focus groups:

- Feelings of frustration when using E-learning
- Resistance to using E-learning
- Lack of teaching resources in classrooms
- Technology being out of date
- Student equity associated with accessing E-learning.

Based on the above literature and research findings from Phase 1, the researcher's next task was to locate validated survey instruments. She located a total of five student-related surveys and five academic-focused surveys (see Appendices 6a and 6b).

6.2.3 Review of existing potential survey instruments – students

Computer information literacy (CIL) continues to be an issue in nursing education, as previous research has indicated (Wallace, Shorten *et al.* 2000, Shorten, Wallace *et al.* 2001, Saranto & Hovenga 2004, Skiba 2005, Courey, Benson-Soros *et al.* 2006, Craig & Corrall 2007, Fetter 2009). It was important, therefore, to include items that focused on CIL in the development of the student questionnaire (see review in Appendix 6a).

The researcher located instruments that addressed CIL and student attitudes to computer use (Sun, Tsai et al. 2008, Teo 2008, Head & Eisenberg 2009, Morris, Gullekson et al. , Smith & Caruso 2010). She examined four instruments, only three of which had a primary focus on student attitudes and/or perceptions regarding E-learning and ICT. The fourth instrument, Project Information Literacy (PIL) Survey (Head & Eisenberg 2009), was not regarded as suitable because it was specific to course-related research project writing. Therefore, it was not used. The three instruments considered for possible use were as follows:

- E-Learner satisfaction (ELS) (Sun, Tsai *et al.* 2008)
- The Attitudes Toward Computer Usage Scale version 2 (ATCUS v. 2.0). First version developed in 1986 by Popovich (Morris, Gullekson *et al.* 2009)
- The Educause Centre for Analysis and Research (ECAR) Study of Undergraduate Students and Information Technology (Smith, Salaway *et al.* 2009).

Two of the above three instruments – Sun, Tsai *et al*. (2008) and Morris, Gullekson *et al*. (2009) – did not address blended learning (i.e. face-to-face teaching and online learning) (see Appendix 6a), which was an important issue found in Phase 1 of this study.

The ECAR (Smith, Salaway *et al.* 2009) validated tool consisted of 37 items developed to examine how information technology affected the college experiences of students in the United States of America (USA). The researcher decided not to use the entire ECAR instrument (see Appendix 6c) because the survey contained items that were not relevant to the Australian context. Therefore, the researcher decided to develop a new instrument (questionnaire) for nursing students that included current E-learning and associated technology, and reflected the findings from Phase 1 of the study.

6.2.4 Review of existing potential survey instruments – academics

Six instruments were identified in the literature between 2005 and 2010 that measured academic attitudes, and beliefs about, satisfaction with and support required when using ICT and associated E-learning technologies (see Appendix 6b). These were:

1. Attitudes Toward Web-based Professional Development (AWPD) (Kao & Tsai 2009)
2. Teachers' Beliefs and IT use in the Classroom (TBITC) (Tondeur, Hermans *et al.* 2008)
3. Information Technology Attitude Scales for Health (ITASH) (Ward & Moule 2009)
4. Online Faculty Satisfaction Survey (OFSS) (Wasilik & Bolliger 2009).
5. Use of E-learning Environments by University Teachers (UEEUT) (Mahdizadeh, Biemans *et al.* 2008)
6. Assessing Faculty Technology Needs (AFTN) (Crews, Miller *et al.* 2009).

Three of these six were found to be unsuitable because they did not deal with the university environment (Ward & Moule 2009, Kao and Tsai 2009, Tondeur, Hermans et al 2008) and another did not examine the blended learning environment (Wasilik & Bolliger 2009).

The remaining two validated survey instruments were found to be useful for the purposes of this study (Mahdizadeh, Biemans *et al.* 2008, Crews, Miller *et al.* 2009). The first instrument was developed at the University of South Carolina's Center for Teaching Excellence to assess how academics used ICT in a university setting (Crews, Miller *et al.* 2009). Permission was granted to use the tool in its entirety (see Appendix 6d). The Use of E-learning Environments by University Teachers (UEEUT) was developed by Mahdizadeh *et al.* (2008) and focused on determining factors affecting of the use of E-learning by academics. Permission to use the questionnaire was granted by the authors (see Appendix 6e).

6.3 Development steps of the items in scales

The researcher developed two separate instruments (questionnaires) that examined the issues identified through the literature and Phase 1 of the study.

The steps of instrument development suggested by Nardi (2014) and Rowley (2014), and the essential elements of questionnaires recommended by Rattray and Jones (2007), were used to guide item development. A seven point Likert scale was used to provide respondents with a greater scope to express their view rather than a five point scale (Joshi, Kale *et al.* 2015). The process of scale development for the two questionnaires comprised:

1. Identification of the factors related to E-learning and use of its associated ICT
2. Identification of the items under each factor
3. Designing the format of the scale
4. Testing the validity and reliability of the instrument.

The steps involved in the development of the Nursing Student and Academic E-learning questionnaires follow.

6.4 Development of the Nursing Student E-learning Questionnaire

The Nursing Student E-learning Questionnaire consisted of five sections:

1. Demographic characteristics (8 items)
2. ICT ownership, age and usage (3 items)
3. Student perceptions of E-learning (SPEL) (32 items)
4. Student database searching skills (DSS) (12 items)
5. Two open response questions.

6.4.1 Demographic characteristics

The literature identified a number of characteristics about students that could impact on E-learning. The researcher wanted to identify students commencing their university studies, students studying part time and students older than 25 years. Therefore, data was collected in regard to the university that students attended, their full or part time status, degree and year of study. Data regarding students' age, first language and postcode was also obtained.

6.4.1.1 Students' age

The Australian Bureau of Statistics (ABS) defines mature age students as being 25 years or older (Australian Bureau of Statistics 2013). The researcher wanted to explore whether students enrolled in an undergraduate nursing degree directly from school would be familiar with studying using some form of online learning. However, students 25 years of age and older may not have experienced online learning because they may have been in the workforce prior to commencing their undergraduate nursing degree. In 1989, the internet was starting to be used for educational purposes (Kaplan & Haenlein 2016). Students educated prior to this would not have experienced online learning.

6.4.1.2 Students' first language and E-learning

Nursing students with English as their second language (ESL) have been shown to access E-learning more frequently than students who have English as their first language. (Koch, Andrew *et al.* 2010,). Therefore, the researcher wanted to determine whether students with ESL perceived E-learning and its associated technology as an enabler or barrier to their learning.

6.4.1.3 Students' postcode and E-learning

Although access to the internet in Australia continues to improve, there are still households that do not have access. In 2012, 80% of households in capital cities had internet access (Australian Bureau of Statistics 2014-2015). Regions of Australia are divided into postcodes, and the Index of Relative Socio-economic Disadvantage (IRSD), a general socio-economic index used by the ABS (see Figure 6-1), is based on those postcodes.

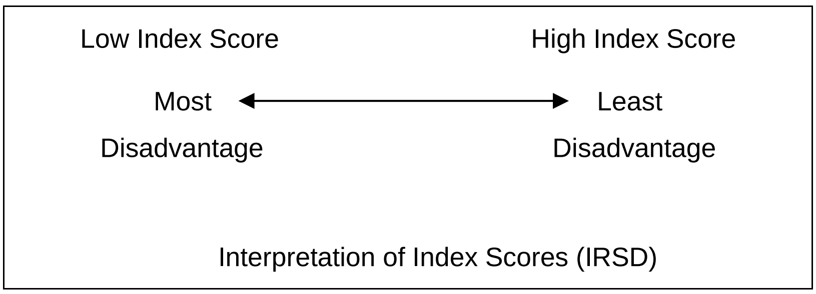

Figure 6-1 Index of relative social disadvantage

The IRSD summarises a range of information about the economic and social conditions of people and households within an area using a list of weighted variables (see Appendix 6j). Therefore, the researcher wanted to investigate if there was an association between students' ability to access the internet and their IRSD score according to a weighted combination of the selected indicators of advantage and disadvantage, which have been standardised to a distribution with a mean of 1000 and standard deviation of 100 (Australian Bureau of Statistics 2013). An area with all of its indicators equal to the national average will receive a score of 1000. The score for an area will increase or decrease dependent on the indicators' relationship to the national average. Indicators that are further away from the national average have a larger impact on the score. For example, an area with an index score of 980 would have most of its indicators closer to the national average than an area with an index score of 900 (Australian Bureau of Statistics 2013).

A low score points towards greater disadvantage in general. For example, an area could have a low score if there are (among other things) many households with low income, many people without qualifications or many people in low skilled occupations. A high score designates a relative lack of disadvantage in general. For example, an area may have a high score if there are (among other things) few households with low incomes, few people without qualifications and few people in low skilled occupations (Australian Bureau of Statistics 2013).

6.4.2 ICT Ownership, age and usage

The ECAR study of Undergraduate Students and Information Technology (Dahlstrom & Bichsel 2014) collected data related to ICT ownership and age between 2009 and 2014. Over the years, ownership of ICT devices increased, and those students with the most current devices were accessing online resources and the internet more frequently than students with older ICT devices (Dahlstrom & Bichsel 2014). The researcher wanted to examine how ICT ownership and the length of time spent online impacted on students' perception of E-learning.

6.4.2.1 Ownership and age of ICT equipment

Questions relating to the age of ICT devices were included in the questionnaire because the researcher wished to examine whether this factor influenced students' attitudes to E-learning. The researcher believed that the age of ICT devices was related to issues that can occur when using older equipment that does not contain the required software and media plugins compatible with the Learning Management System (LMS) (Abdelaziz, Samer Kamel *et al.* 2011, Luppicini 2012). The Australian Taxation Office (ATO) ruling on the effective life of a computer was used for the purposes of this study (both student and academic questionnaires). The ATO regarded the effective life of a desktop computer to be four years and a laptop computer to be three years (Australian Taxation Office 2016).

6.4.2.2 Time students spent online and E-learning

A student's readiness to be involved in E-learning can be partly determined by the amount of time the student spends online (Hung, Chou *et al.* 2010). Therefore, the researcher wanted to investigate approximately how many hours per week students were online. A recent study from the United Kingdom (UK) (Ofcom 2015) found that the average adult spends more than 20 hours online a week, including time at work. The biggest increase has been among young adults, with time spent online almost tripling from 10 hours and 24 minutes each week in 2005 to 27 hours and 36 minutes in 2014 (Ofcom 2015).

6.4.3 Student perceptions of E-learning (SPEL)

The researcher developed a series of 32 items based on the Phase 1 findings, the literature and the instruments developed by Morris *et al*.(2009) and Smith and Caruso (2010). There were 15 positive questions about using ICT and E-learning, and 12 negative questions. There were four other items: one related to academic integrity; the second sought respondents' understanding of information literacy; and the final two were associated with how nurses use ICT in the workplace.

6.4.4 Student database searching skills (DSS)

The following 12 questions concerned levels of students' Database Searching Skills (DSS). DSS has been an issue in nursing education for over 30 years (Shorten, Wallace *et al.* 2001, Saranto & Hovenga 2004, Skiba 2005, Fetter 2009). The first six items related to database searching strategies. The next four items related to accessing sources from the internet. The final two items were concerned with how to reference articles in assignments.

6.4.5 Open response questions

There were two open response questions. One sought information from students about how the university could enhance their E-learning. The last question asked the students to list any challenges they faced with their E-learning (see Appendix 6h). These responses were analysed using qualitative content analysis, as explained in Chapter 4 section 4.10.

The following section describes the development of the Academic questionnaire.

6.5 The Nursing Academic E-learning Questionnaire

This questionnaire consisted of six sections:

1. Demographics (five items)
2. ICT ownership, age of device and use (three items)
3. Academic Perceptions of E-learning (APEL) (24 items)
4. Willingness to use E-learning (33 items)
5. Professional development (16 items)
6. Two open response questions.

6.5.1 Academic demographics

Data was collected in regard to the university that academics attended, their full or part time status, the area in which they predominantly taught and the length of time they had been employed at the university.

6.5.1.1 Years of employment

In 1995, the first commercial internet access was provided (Clarke 2004). Prior to this time, academics were using desktop computers, but they were not connected to the internet. The researcher wanted to determine how academics who had experienced working in the university both with and without the internet perceived the value of E-learning.

6.5.2 ICT ownership, age of device and use

As previously stated for the student questionnaire, the ECAR study of Undergraduate Students and Information Technology (Dahlstrom & Bichsel 2014) collected data related to ICT ownership and age between 2009 and 2014, and found that over the years, as ownership of ICT devices increased, those students with the most current devices accessed online resources and the internet more frequently than students with older ICT devices (Dahlstrom & Bichsel 2014). Similar data has not been collected for academics. The researcher wanted to examine how ICT ownership and the length of time spent online impacted on academics' perception of E-learning and its associated technology.

6.5.2.1 Ownership and Age of academic device

The rationale for asking academics the age of their ICT devices was based on the premise that there is a relationship between the age of ICT equipment and academics' perceptions of the value of E-learning (Birch & Burnett 2009, Smith & Caruso 2010).

6.5.2.2 Time academics spent online and E-learning

Previous studies have found a positive correlation between the number of hours academics spent online and their perception of the value of E-learning (Bettany-Saltikov & Whittaker 2013). As mentioned previously in the student instrument development section, a recent UK study (Ofcom 2015) found the average adult spends more than 20 hours online a week, including time at work (Ofcom 2015).

6.5.3 Development of the Academic Perceptions of E-learning (APEL) Scale

The next 24 items comprised the Academic Perceptions of E-learning (APEL) Scale. There were 13 items concerning positive aspects about ICT and E-learning and 10 items focusing on the problematic aspects of using ICT and E-learning. The final item was a pedagogical question related to student learning. These items were based on items from Use of E-learning Environments by University Teachers (UEEUT) (Mahdizadeh, Biemans *et al.* 2008).

6.5.4 Willingness to use E-learning

The next 33 items focused on the willingness of academics to use a variety of ICT and E-learning technologies. Twenty-six items came from the Assessing Faculty Technology Needs (AFTN) tool (2009) (see Appendix 6d). The first 11 items were about types of ICT software programs used by academics to communicate and teach. The next 11 items concerned ICT technology used in the face-to-face and online classroom environments. The next four items concerned software programs used by academics in their work. The final seven items were developed by the researcher to determine the use of a variety of clinical ICT that would usually be located in the nursing laboratories and used by academics to demonstrate clinical skills.

6.5.5 Professional development

The need for effective professional development (PD) was a concern raised by academics in Phase 1 of the study, as well as being highlighted in the literature (Steinert, McLeod *et al.* 2009, Donovan & Green 2010, Yeung, Taylor *et al.* 2012). The following 24 items were taken from the Assessing Faculty Technology Needs (AFTN) tool (2009). The first eight items asked if a variety of delivery methods for accessing professional development was available at the university where they were employed. The next eight items asked which particular type of PD delivery was most effective. The final eight items asked which form of PD delivery was most helpful.

6.5.6 Open response questions

The final two questions were open response. The first open response question asked how the university could enhance academics' teaching. The last question asked the academics to list any challenges they faced associated with their teaching (see Appendix 6i). The next section describes the procedures undertaken to ensure the validity and reliability of the two developed questionnaires (instruments).

6.6 Validity and reliability of the student and academic scales

The validity of an instrument can be achieved through a variety of approaches, such as tests of face validity, content validity, factor analysis, criterion validity and construct validity (Nardi 2014, Rowley 2014).

6.6.1 The Scale Content Validation Index (S-CVI)

Following the internal review by the researcher and her supervisors, it was important to seek the views of experts external to the researcher to identify items that were irrelevant and those that were highly relevant (Rattray & Jones 2007, Nardi 2014, Rowley 2014). Following the development of the items for the two questionnaires, cooperation was sought from a panel of five expert academics and researchers, which comprised two senior PhD qualified academics with strength in survey design and three senior academics who taught predominantly in undergraduate nursing topics. Lynn (1986) recommends at least three and not more than 10 people for a panel. The expert panel members were asked to rate each item for relevance on a scale of one to four (1=Not relevant, 2=Somewhat relevant, 3=Quite relevant, 4=Highly relevant) for both the student and academic surveys.

Each item was evaluated for relevance by the expert panel and the total score was averaged for all five scores. This total score has been referred to as the “item content validity index” (item CVI or I-CVI). A score of 78% or higher is considered acceptable (Hammonds, Matherson *et al.* 2013). The first round of expert panel opinions resulted in three items being reworded and two items being removed from each of the questionnaires because the panel saw them as irrelevant.

Having arrived at the I-CVI for each item, the final step was to calculate the scale content validity (S-CVI). The S-CVI is the quotient of the total expert panel score divided by the total number of items in the scale (Zamanzadeh, Rassouli *et al.* 2015). A second round of item validation was undertaken with the Student (SPEL) questionnaire items, which reached a S-CVI of 0.99. The academic (APEL) questionnaire items reached a S-CVI of 0.97.

6.6.2 Test–retest reliability

Nardi (2014) recommended that following development, survey instruments should be pilot tested on two separate occasions as a mechanism for determining reliability. This form of testing provided the researcher with an opportunity to assess the flow of each questionnaire, whether the instructions to respondents were clear and concise, and the wording of the items was clear and easily understood, and to determine the length of time each questionnaire took to complete.

It was important that the groups selected to test each questionnaire were similar to the two groups at the focus of the study, namely the nursing students and academics. The method of delivery was important because the questionnaires were being accessed by respondents through an embedded hyperlink within an email sent from a designated staff member from the schools of Nursing who participated.

For the pilot test, the researcher sent 20 emails containing the hyperlink, 10 to a group of postgraduate students and 10 to a group of academics not predominantly involved in undergraduate nursing teaching. The researcher received a total of 17 completed questionnaires in the first round and 12 when the questionnaire was sent the second time three weeks later. The test participants also were asked to include any comments that would assist the researcher to improve the questionnaires. The researcher acknowledged comments regarding the page layout and changed this in the final version of the questionnaire. The researcher then correlated the results of the two questionnaires using an independent t-Test to determine the degree of agreement in the results of each. The two sets of questionnaires showed a high degree of stability; similar responses for each respondent (Hammonds, Matherson *et al.* 2013, Nardi 2014).

6.6.3 Exploratory factor analysis of the SPEL and APEL scales

Factor analysis is a common measure used to assess structural validity and the interrelationship of variables that are used to describe and determine the instrument's underlying constructs (Rattray & Jones 2007). An exploratory principal component analysis (PCA) factor analysis allows for estimates of population values for factor loadings by maximising the probability of the sampling from the data population (Tabachnick & Fidell 2014). Therefore, this was the extraction method chosen for the current study.

The sample size should be at least 180 to conduct a factor analysis (Tabachnick & Fidell 2014). Comrey and Lee (1992) suggested the following guidelines for adequacy of sample size for a researcher undertaking factor analysis using maximum likelihood extraction analysis: 50=very poor; 100=poor; 200=fair; 300=good; 500=very good; and 1000 or more=excellent (Comrey & Lee 1992 p. 217). However, Guadagnoli and Velicer (1988) suggested that if a factor has four or more variables and the loadings are above 0.60, the pattern may be interpreted whatever the sample size used. They suggested that for patterns composed of many variables (10 to 12) but with loadings less than 0.40, the lowest sample size possible is 150 respondents (Guadagnoli & Velicer 1988).

The size of the student sample after correction was 466 and for the academic sample it was 203 respondents. Therefore, both sample sizes were adequate to undertake factor analysis. Once validity was obtained, the researcher tested the internal consistency reliability of items in each factor. The questionnaires were validated prior to the test for internal consistency (Rowley 2014).

6.6.3.1 Factor analysis of the Student Perceptions of E-learning (SPEL) Scale

The 32 items from the Student Perceptions of E-learning (SPEL) Scale were subjected to PCA factor analysis using SPSS™ version 22. Only 12 of the 32 items indicated loadings of 0.3 and above. Prior to performing PCA, the researcher assessed the suitability of the data for factor analysis. Inspection of the correlation matrix revealed the presence of 12 coefficients of 0.3 and above (Hayton, Allen *et al.* 2004). The Kaiser-Meyer-Olkin value was 0.822, exceeding the recommended value of 0.6 (Kaiser 1974), and Bartlett's test of Sphericity (Bartlett 1954) reached statistical significance, indicating that factors could be determined from the correlation matrix.

Principal component analysis factor analysis revealed the presence of three components with eigenvalues exceeding 1, explaining 36.99%, 20.16% and 10.16%% of the variance respectively. An inspection of the scree plot revealed a break after the third component. Using Catell's (1966) scree test, the researcher decided to retain three components for further investigation (Figure 6-2).

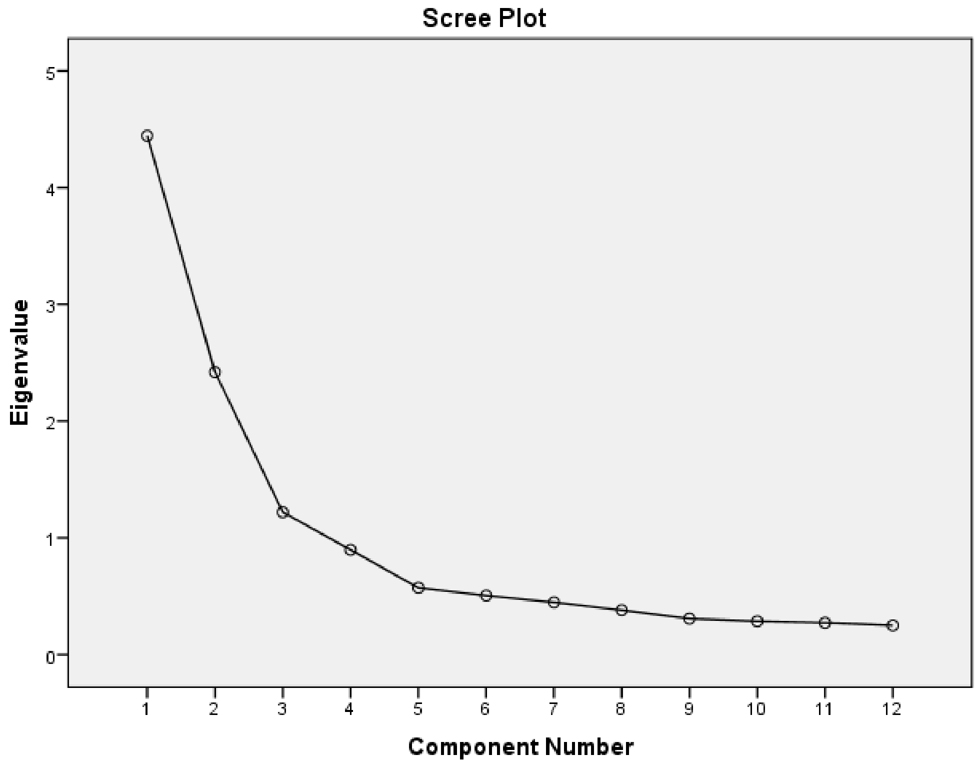

Figure 6-2 Student scree plot and Parallel analysis for student PCA

The determination from the scree plot was further supported by the results of the Parallel Analysis, which showed only three components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (12 variables X 466 respondents) (see Table 6-1).

Table 6-1 Monte Carlo Parallel analysis for Student PCA

Eigenvalue #	Random Eigenvalue	SD
1	1.2696	0.0391
2	1.1965	0.0276
3	1.1423	0.0223
4	1.0964	0.0203
5	1.0537	0.0195
6	1.0125	0.0187
7	0.9734	0.0180
8	0.9354	0.0185
9	0.8964	0.0191
10	0.8558	0.0205
11	0.8105	0.0241
12	0.8578	0.2673

The three-factor solution explained a total of 67.33% of the variance (see Table 6-2). The researcher performed oblimin rotation to aid the interpretation of these three factors. The rotated solution revealed a simple structure, with the three factors showing a number of strong loadings (Table 6-2 and Table 6-3). Additional supporting evidence can be found in Appendix 6f.

Table 6-2 Student total variance explained

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4.440	36.997	36.997	4.440	36.997	36.997	4.184
2	2.420	20.164	57.161	2.420	20.164	57.161	2.530
3	1.220	10.165	67.326	1.220	10.165	67.326	2.125
4	.898	7.487	74.813				
5	.571	4.762	79.575				
6	.507	4.224	83.798				
7	.448	3.732	87.530				
8	.381	3.173	90.703				
9	.308	2.564	93.267				
10	.285	2.377	95.644				
11	.273	2.276	97.920				
12	.250	2.080	100.000				

Extraction Method: Principal Component Analysis.
a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 6-3 Student PCA pattern matrix component above 0.3

Pattern Matrix[a]

	Component		
	1	2	3
E-learning is an important element in my course	0.817		
E-learning is one of a number of important components	0.799		
E-learning makes my course enjoyable	0.796		
E-learning makes studying easier for me	0.774		
Without E-learning I would be unable to study	0.713		
E-learning has increased the flexibility of my university study time	0.711		
It would be good if there was more E-learning	0.679		
I have difficulty finding my way around the library databases (RevCode)		0.915	
I find it difficult to find my way around the library catalogue (RevCode)		0.866	
I have difficulty finding my way around the university websites (RevCode)		0.705	
I find ICT difficult to use(RevCode)			-0.842
I have high levels of anxiety when using computers (RevCode)			-0.839

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Table 6-4 Student all component structure matrix

Structure Matrix	Component		
	1	2	3
E-learning makes my course enjoyable	0.823	0.207	-0.276
E-learning is an important element in my course	0.801	0.108	0.022
E-learning makes studying easier for me	0.799	0.141	-0.334
E-learning is one of a number of important components	0.783	0.109	0.038
E-learning has increased the flexibility of my university study time	0.735	0.247	-0.160
It would be good if there was more E-learning	0.698	0.070	-0.350
Without E-learning I would be unable to study	0.683	0.066	0.158
I have difficulty finding my way around the library databases (RevCode)	0.111	0.906	-0.233
I find it difficult to find my way around the library catalogue (RevCode)	0.127	0.856	-0.205
I have difficulty finding my way around the university websites (RevCode)	0.233	0.772	-0.395
I have high levels of anxiety when using computers (RevCode)	0.177	0.351	-0.876
I find ICT difficult to use(RevCode)	0.082	0.318	-0.862

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

6.6.3.2 Factor analysis of Academic Perceptions of E-learning (APEL) Scale

The 24 items of the Academic Perceptions of E-Learning (APEL) Scale were subjected to PCA factor analysis using SPSS™ version 22. Prior to performing PCA, the researcher assessed the data’s suitability for factor analysis. Inspection of the correlation matrix revealed the presence of 16 coefficients of 0.3 and above. The Kaiser-Meyer-Olkin value was 0.862, exceeding the recommended value of 0.6 (Kaiser 1974), and Bartlett’s test of Sphericity (Bartlett 1954) reached statistical significance, implying that factors could be determined from the correlation matrix.

An inspection of the scree plot revealed a break after the third component. Using Catell’s (1966) scree test, the researcher decided to retain three components for further investigation (see Figure 6-3 next page).

The determination from the scree plot was further supported by the results of the parallel analysis, which showed only three components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (16 variables X 203 respondents) (see Table 6-5 next page).

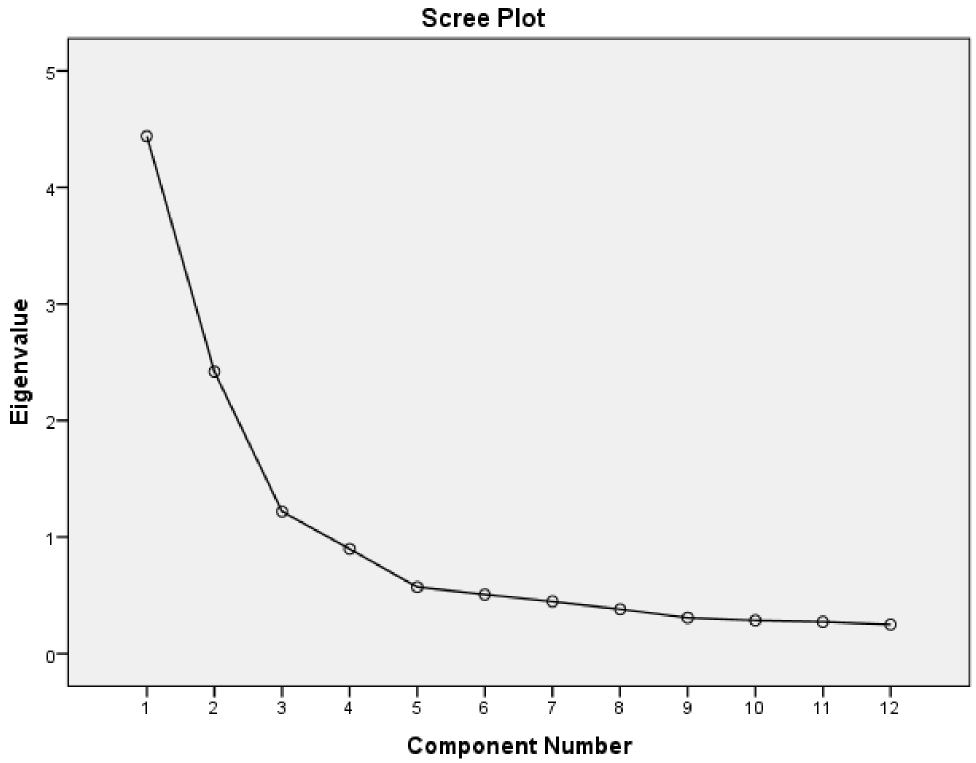

Figure 6-3 Academic scree plot and parallel analysis

Table 6-5 Monte Carlo parallel analysis for Academic PCA

Eigenvalue #	**Random Eigenvalue**	**SD**
1	1.5145	0.0637
2	1.3999	0.0455
3	1.3151	0.0372
4	1.438	0.0321
5	1.1771	0.0304
6	1.1162	0.0285
7	1.0582	0.0283
8	1.0046	0.0261
9	0.9517	0.0254
10	0.9006	0.0263
11	0.8503	0.0260
12	0.8006	0.0255
13	0.7505	0.0275
14	0.6995	0.0287
15	0.6426	0.0314
16	0.5746	0.0347

Principal component analysis factor analysis revealed the presence of three components with eigenvalues exceeding 1, explaining 36.10%, 12.82% and 10.50% of the variance respectively.

The three-component solution explained a total of 59.42% of the variance. The researcher performed oblimin rotation to aid in the interpretation of these three components. The rotated solution revealed a simple structure, with the three components showing a number of strong loadings (see tables 6-6, 6-7 and 6-8). Additional supporting evidence can be found in Appendix 6g.

Table 6-6 Academic (APEL) 16-item scale Factor analysis Total Variance Explained

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.776	36.102	36.102	5.776	36.102	36.102	5.377
2	2.051	12.819	48.922	2.051	12.819	48.922	2.789
3	1.679	10.495	59.417	1.679	10.495	59.417	2.680
4	.823	5.142	64.559				
5	.769	4.803	69.363				
6	.716	4.475	73.838				
7	.697	4.354	78.192				
8	.568	3.552	81.744				
9	.510	3.188	84.932				
10	.484	3.026	87.958				
11	.399	2.496	90.454				
12	.379	2.369	92.823				
13	.334	2.089	94.912				
14	.309	1.933	96.845				
15	.286	1.790	98.635				
16	.218	1.365	100.000				

Extraction Method: Principal Component Analysis.

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

Table 6-7 Academic PCA Pattern matrix component above 0.3

Pattern Matrix[a]			
	Component		
	1	2	3
E-learning activities are more interesting than paper based activities	0.846		
Students learn more from web-based activities than paper based	0.795		
E-learning would enhance my effectiveness in teaching	0.775		
I prefer web-based to paper based activities	0.750		
Student learning Improved by E-learning	0.712		
E-learning is stimulating	0.698		
E-learning increases interaction between teacher/students and student/student	0.679		
Considering time I prefer to use E-learning	0.669		
Well-designed websites are easy to learn from	0.601		
There is not enough time to develop E-learning resources		0.865	
E-learning has increased my workload (RevCode)		0.760	
No time for E-learning (RevCode)		0.747	
Computer instructions work more difficult (RevCode)		0.482	
Confident Using Comp			0.817
I am confident using the internet as a learning resource			0.791
I have high anxiety when using computers (RevCode)			0.751

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 5 iterations

Table 6-8 Academic all component PCA Pattern matrix

Academic all component Pattern Matrix[a]	Component		
	1	**2**	**3**
E-learning activities are more interesting than paper based activities	0.846	-0.068	0.022
Students learn more from web-based activities than paper based	0.795	-0.103	-0.162
E-learning would enhance my effectiveness in teaching	0.775	0.164	-0.166
I prefer web-based to paper based activities	0.750	-0.076	0.119
Student Learning Improved by E-learning	0.712	.033	0.183
E-learning is stimulating	0.698	0.092	0.163
E-learning increases interaction between teacher/students and student/student	0.679	0.005	-0.142
Considering time I prefer to use E-learning	0.669	0.245	0.062
Well-designed websites are easy to learn from	0.601	-0.057	0.177
There is not enough time to develop E-learning resources (RevCode)	0.101	-0.865	0.014
E-learning has increased my workload (RevCode)	0.048	0.760	-0.070
No time for E-learning (RevCode)	-0.001	0.747	0.026
Computer instructions make work more difficult	0.270	0.482	0.261
Confident Using Comp	-0.046	0.096	0.817
I am confident using the internet as a learning resource	0.096	-0.111	0.791
I have high anxiety when using computers (RevCode)	-0.026	0.033	0.751

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 5 iterations.

6.6.4 Determining scale reliability and internal consistency

The second criterion used for measuring reliability of the questionnaires was to measure their internal consistency. The Cronbach's alpha statistic uses the inter-item correlations to determine whether items within the scale are measuring the same domain (Pallant 2013, Nardi 2014, Rowley 2014). The researcher calculated the Cronbach's alpha coefficient of reliability for each factor for both the Student (SPEL) and Academic (APEL) questionnaires developed in this study, and all were found to be above the recommended value of 0.7 (Table 6-9) (Rattray & Jones 2007, Pallant 2013).

Table 6-9 SPEL and APEL Cronbach's alpha coefficient

SPEL (n=466)	**Cronbach's Alpha Based on Standardised Items**	**Number of items**
Factor 1: Database searching is difficult	0.75	2
Factor 2: E-learning adds value	0.87	7
Factor 3: ICT is frustrating and causes anxiety	0.81	2

APEL (n=203)	Cronbach's Alpha Based on Standardised Items	Number of items
Factor 1: E-learning adds value	0.88	9
Factor 2: Problems with E-learning	0.74	4
Factor 3: Confident using E-learning	0.72	2

6.7 Chapter summary

The researcher has provided an overview of current student and academic attitude scales to E-learning found in the literature between 2000 and 2010, and used previously developed tools for item comparison. Rationale as to the suitability or non-suitability of each survey instrument located in the literature has been provided, and the decision to develop two new instruments (questionnaires) for the current study has been justified.

The development of the two new questionnaires has been described, including the factor analysis, and how validity and reliability were measured. The final two questionnaires containing the validated instruments – the 12-item Student Perceptions of E-learning Scale (SPEL) and the 16-item Academic Perceptions of E-learning (APEL) Scale – have been presented for the reader.

The next chapter displays the results of the two questionnaires, which were distributed online to schools of Nursing and Midwifery across Australia.

Chapter 7 Phase 2 Results

7.1 Introduction

This chapter presents the major findings from Phase 2 of the study – issues in E-learning and its associated technology for nursing and midwifery students and their academics in undergraduate nursing programs in Australia. The results present the student and academic participants' demographic information, descriptive and non-parametric statistics, and factor analyses of the Student Perceptions of E-learning (SPEL) Scale and the Academic Perceptions of E-learning (APEL) Scale. Following the univariate analysis, both sets of data were also analysed using multivariate analysis. Throughout this chapter, the students' results are presented first (Part A), followed by the academics' results (Part B).

PART A: STUDENTS' RESULTS

7.2 Student demographic characteristics

Demographic information is included in this study to provide an overall description of the student participants. Data was collected from July 2011 until February 2012. The researcher had received 492 questionnaires by the end of the data collection period. Those questionnaires where the APEL Scale was missing were omitted from the final sample, leaving a total of 466 questionnaires available for analysis. A more detailed description of the management of missing data for both student and academic samples has been provided in Chapter 4.

Demographic data collected for students included respondents':

- Age
- Gender
- Area of study; nursing or midwifery
- Year of study
- Status as a student (full time/part time)
- English as second language
- Current postcode.

The relationship between the demographic data and three identified factors from the APEL Scale was then tested using the hypotheses outlined in this section.

7.3 Student response rate per university

Responses were received from students from 13 of the 19 universities involved in the study, with 72% (n=336) of the respondent cohort undertaking their study full time. This result was comparable with the 2011 Graduate Course Experience survey characteristics, in which 88.4% of undergraduate students indicated that their university attendance was full time (Graduate Careers Australia 2011).

The 466 student responses represented 3.7% of the students enrolled at the time of data collection. The number of students who responded from the same university ranged from 1-121 (see Table 7-1).

Table 7-1 Frequency of student responses based on university

University code	Approximate number students (2012)	Number responses	%
1	1027	26	2.5
2	2187	93	4.3
4	2000	10	0.5
5	2020	47	2.3
7	910	36	4.0
8	750	11	1.5
10	640	121	18.9
14	753	24	3.2
15	965	41	4.2
18	972	32	3.3
19	No data available	3	N/A
20	450	21	4.7
21	No data available	1	N/A
Total	**12674**	**466**	**3.7**

(Note: University codes are not consecutive because student responses were not received from all universities)

7.4 Student participants

The link to the student surveys was sent to 19 universities in Australia where the Dean or Head of School agreed to be involved in the research. Nursing and midwifery students responded from 13 universities across Australia, representing five of the seven states and territories. No responses were received from the schools of Nursing and Midwifery in Tasmania and Canberra.

The students' age ranged from 17 to 62 years (see Appendix 7a for full age demographics). The mean age for respondents was 30.5 years (SD 11.2), with the most frequent age being 19 years (9.4%; n=44). The age distribution for the study cohort was consistent with that recorded by the Australian Bureau of Statistics in 2011 for students enrolled in higher education. Ninety three percent (n=431) of the respondents identified as female (see figures 7-1 and 7-2).

The student sample demographics were compared to the latest data available from the *Australia's future health workforce: nurses, detailed report* (Health Workforce Australia 2014). The study sample resembled the ABS data across age and frequency. Historically, nursing has been a female dominated profession, and the trend continues with male nurses comprising 10% of those nurses seeking registration with the Nursing and Midwifery Board of Australia in 2012 (Australian Institute of Health and Welfare 2013). In the current sample, males comprised 7.1%. It was noted that 88% (n=410) of the cohort were nursing students and 11.8% (n=55) were midwifery students. Most student respondents had English as their first language (90.6%), with students with English as a second language (ESL) spread across all year levels (see Table 7-2).

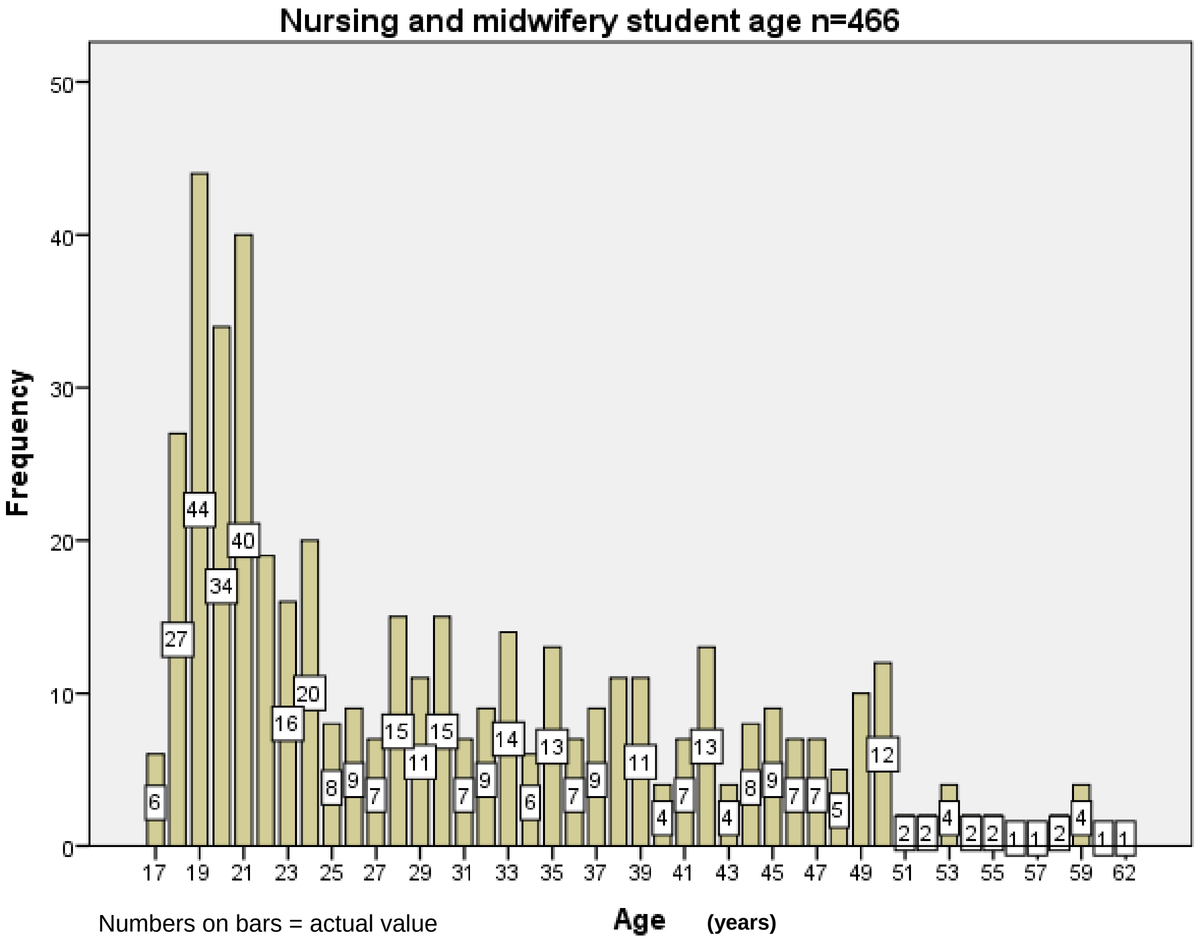

Figure 7-1 Nursing and midwifery students' age

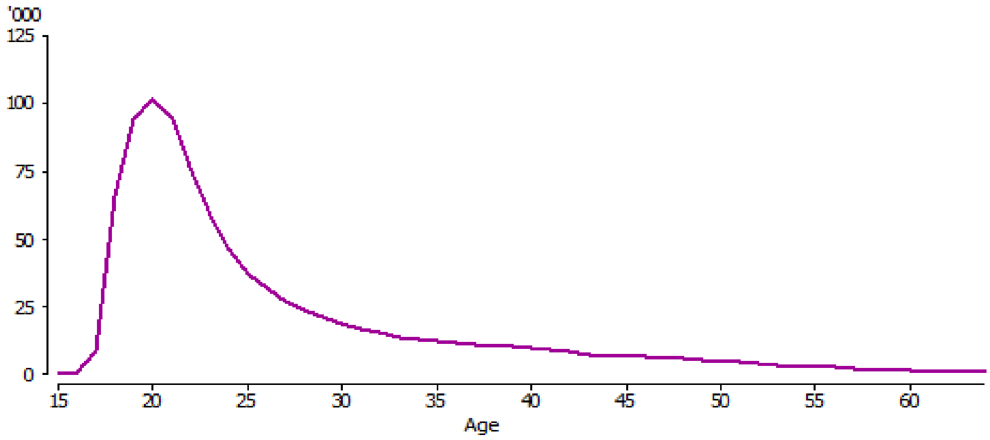

Figure 7-2 Number of Higher education students by age
(Australian Bureau of Statistics 2013) viewed 3 June 2016
http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20July+2013#data

Table 7-2 Summary of student demographics

Student demographic summary *n*=466				
Age	**Range**	**Mean (SD)**		
	17 – 62	30.5 (11.2)		
Gender	Female 431	Male 33 (7.1%)		
(2 missing)	(92.5%)			
Status as a student	Fulltime	Part time		
	336	130 (27.9%)		
	(72.1%)			
Area of study	Nursing 410	Midwifery 55 (11.8%)		
(1 missing)	(88%)			
Year of study	1st yr. 159	2nd yr.	3rd yr. 112 (24%)	Grad Entry
(1 missing)	(34.1%)	174 (37.3%)		20 (4.3%)
English as second language n=43	1st yr.	2nd yr.	3rd yr.	Grad entry
	12 (7.5%)	15 (8.5%)	12 (10.7%)	4 (20%)
(1 missing)				

There were 55 midwifery students who completed the questionnaire. When the two groups of students were compared against the three factors identified from the SPEL that influenced students' attitudes to E-learning (F1 "Data searching difficult"; F2 "E-learning adds value"; F3 "ICT difficult and causes anxiety" – see sections 7.3 and 7.4), the only significant finding (p=0.042) was for F3, indicating that the midwifery students found ICT more difficult to use and caused them more anxiety than the nursing students. However, the effect size was small (r = 0.094; <0.1) (Cohen 1988).

Table 7-3 Course of study and E-learning factor relationship

Program of study	n	F1:Data searching difficult score (max score 21) Median (IQR)	r	p*	F2:E-learning adds value score (max score 49) Median (IQR)	r	p*	F3:ICT is difficult and causes anxiety score (max score 14) Median (IQR)	r	p*
Nursing	411	12 (8-15)	0.052	0.258	16 (12-23)	0.068	0.141	12 (9-13)	0.094	0.042
Midwifery	55	10 (7-15)			14 (11-21)			12 (10-14)		
Total	**466**	**12 (8-15)**			**15 (12-22)**			**12 (9-14)**		

Mann-Whitney U test

r=effect size

7.4.1 Index of Relative Social Disadvantage (IRSD) of students

One of the factors that may impact on students' computer information literacy (CIL) skills is their ability to own information computer technology (ICT) devices. As discussed in the previous chapter, the researcher used the level of relative social disadvantage determined by the Australian Bureau of Statistics (ABS) as a reflection of students' socio-economic status (Australian Bureau of Statistics 2013). Therefore, the student respondents' postcodes were aligned with the IRSD value (see Appendix 6j for ABS IRSD factors used to determine social disadvantage). The mean IRSD was 998.70 (SD 53.14), with 56% (n=261) of respondents living in postcodes corresponding to an IRSD below the national average of 1000 (see Figure 7-3). Hence, these students would have experienced some level of relative social disadvantage (Australian Bureau of Statistics 2013).

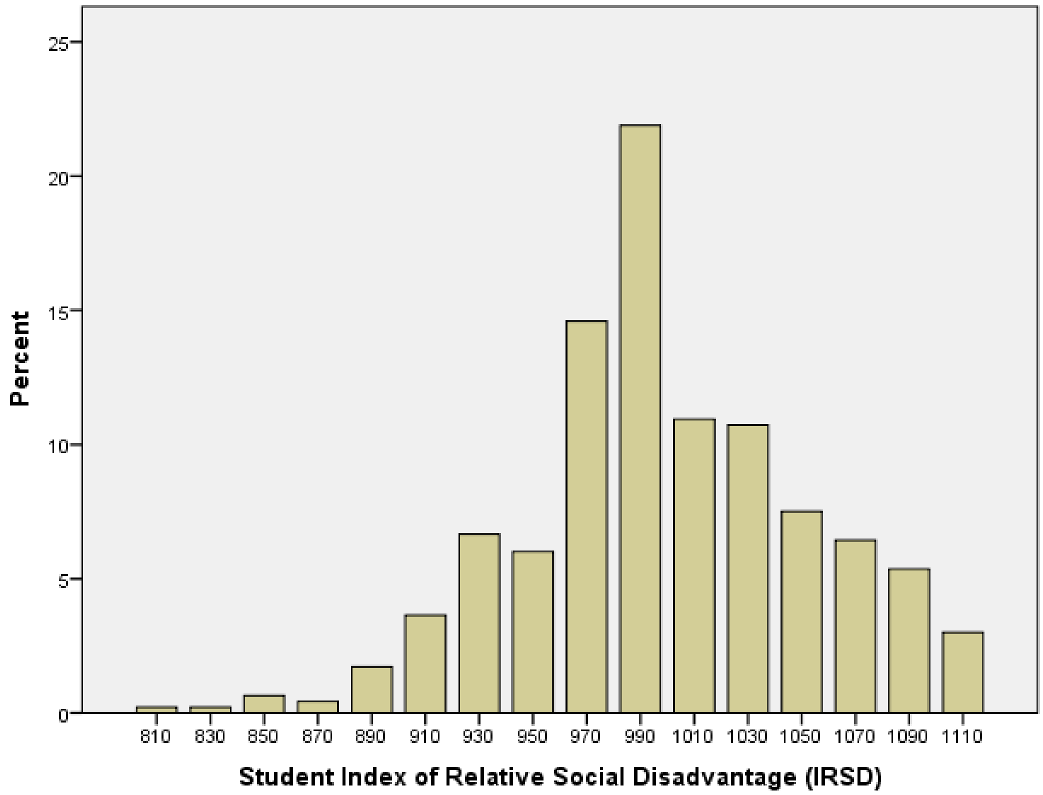

Figure 7-3 Students Index of Relative Social Disadvantage (IRSD)

Also, it was noted that students who identified themselves as English as second language (ESL) speakers (n=43) recorded a mean IRSD of 982.7 (SD 57.6), indicating that ESL students lived in areas very close to the national average IRSD index of 1000 (Figure 7-4)

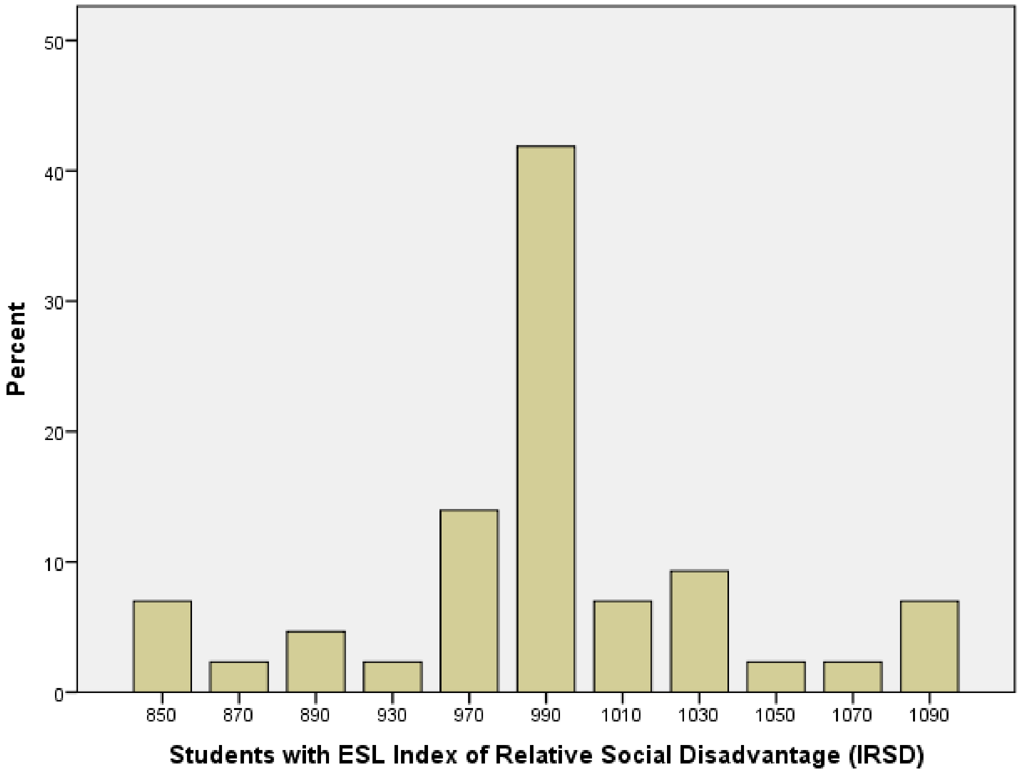

Figure 7-4 Students with ESL Index of Relative Social Disadvantage

7.5 The Student Perceptions of E-learning (SPEL) Scale

The researcher used principle component factor analysis to identify three factors from the SPEL that influenced students' attitudes to E-learning: F1 "Data searching difficult"; F2 "E-learning adds value"; F3 "ICT difficult and causes anxiety". After computing the variables for each factor, the following descriptive results were found (see Table 7-4).

Table 7-4 The SPEL Factor scores

Factor	*Median*	*IQR*
F1 Data searching difficult. Maximum score 21	*12*	*8 - 15*
F2 E-learning adds value Maximum score 49	*15*	*12 - 22*
F3 ICT difficult and causes anxiety. Maximum score 14	*12*	*9 - 14*

These results show that student respondents had average database searching skills, generally did not find that E-learning added value and were anxious about using E-learning.

7.6 Student univariate analysis

Following the exploratory factor analysis, the researcher wanted to investigate relationships with the individually identified issues from Phase 1 and the literature. The researcher developed hypotheses that were used to test the issues with the identified factors: F1 “Data searching difficult”; F2 “E-learning adds value”; F3 “ICT difficult and causes anxiety”. The following section has been constructed to provide the reader with a clear pathway for understanding the rationale and the hypotheses for each univariate that was analysed.

7.6.1 Hypotheses related to age and E-learning

Based on the Australian Bureau of Statistics definition of mature age students, the data was divided into two groups; students under 25 years of age and mature age students 25 years and older (Australian Bureau of Statistics 2013). Mature age students were less likely to have experienced E-learning in their prior education because the internet generally did not feature in the university curriculum until 1995 (Leiner, Cerf *et al.* 2012). Therefore, the following three hypotheses were formulated to consider the effect of age on the three factors (see Table 7-5):

Hypothesis 1: *Students 25 years and older will find database searching more difficult than students who are less than 25 years of age.*

Hypothesis 2: *Students 25 years and older will be more likely to see E-learning as adding value to their learning than students who are less than 25 years of age.*

Hypothesis 3: *Students aged 25 years and older will find ICT more difficult and a source of anxiety than students who are less than 25 years of age.*

Table 7-5 Students’ age and E-learning

Age group	n	F1:Data searching difficult score (max score 21) Median (IQR)	r	p*	F2:E-learning adds value score (max score 49) Median (IQR)	r	p*	F3:ICT is difficult and causes anxiety score (max score 14) Median (IQR)	r	p*
<25 yr	206	13 (8-16)	0.07	0.11	17 (12-24)	0.13	0.005	12 (11-14)	0.17	0.000
≥25 yr	260	12 (8-15)			14 (11-20)			11 (8-13)		
Total	466	12 (8-15)			15 (12-22)			12 (9-14)		

Legend: *Mann-Whitney U Test
r = size effect

Results relating to the first three hypotheses indicate that regardless of age, all student participants found difficulty with searching databases. However, students 25 years and younger had a more positive perception than mature age students that E-learning added value to their learning. The student cohort ≥ 25 years old did not find ICT to be as difficult and a source of anxiety as those <25 years old. The effect size for age on all three factors was small (<0.2) (Cohen 1988).

7.6.2 Hypotheses related to gender and E-learning

The relationship between gender and E-learning was explored because current research still indicates that males spend more time using ICT than females (Drabowicz 2014). However, Li, Wang *et al*. (2015) found in relation to Learning Management Systems (LMS) females spent more time online than male students. Another study by Lone, Bhat *et al.* (2015) found that female students engaged more frequently and longer in online communication, while the male students spent more time working on their computer. These trends have implications for nursing, which attracts more female than male students. The most recent data from the ABS in 2013 reported that 10% of nurses were male. In 2016, the Nursing and Midwifery Board of Australia found that of 5,380 registered general nurses, 13% (n=692) were male. In the current study, male respondents accounted for 7.1% (n=33) of the sample. The following hypotheses were developed to determine whether gender impacted on the students' perceptions of E-learning.

Hypothesis 4: *Female students will find database searching more difficult than male students.*

Hypothesis 5: *Female students will be more likely to see E-learning as adding value to their learning than male students.*

Hypothesis 6: *Female students will find ICT more difficult and a source of anxiety than male students.*

Table 7-6 Students' gender and E-learning

Gender	n	F1:Data searching difficult score (max score 21) Median (IQR)	r	p*	F2:E-learning adds value score (max score 49) Median (IQR)	r	p*	F3:ICT is difficult and causes anxiety score (max score 14) Median (IQR)	r	p*
Female	433	12 (8-15)	0.0006	0.90	15 (11.5-22)	0.10	0.031	12 (9-14)	0.034	0.473
Male	33	12 (7-15)			19 (12-27.5)			12 (10-13.5)		
Total	**466**	**12 (8-15)**			**15 (12-22)**			**12 (9-14)**		

Legend: *Mann-Whitney U Test
r = effect size

Results relating to hypotheses 4, 5 and 6 indicate that regardless of their gender, all student participants found difficulty with searching databases. However, male students had a more positive perception that E-learning added value to their learning than mature age students, with a large effect size (Cohen 1988). All students found ICT to be difficult and a source of anxiety. The effect size for age on factors 1 and 3 was small (<0.1) (Cohen 1988).

7.6.3 Hypotheses related to year of study and E-learning

The student respondents were spread across all three years of the undergraduate nursing programs, including the graduate entry two year pathway, as illustrated earlier in Table 7-2. The following hypotheses were developed to determine whether year of study impacted on the students' perceptions of E-learning.

Hypothesis 7: *Students will find database searching less difficult as they progress through the Nursing and Midwifery curriculum.*

Hypothesis 8: *Students will find E-learning to be more valuable as they progress through the Nursing and Midwifery curriculum.*

Hypothesis 9: *Students will find ICT less difficult and will cause less anxiety as they progress through the Nursing and Midwifery curriculum.*

Table 7-7 illustrates that students' skills and perceptions in relation to E-learning did not differ across all three year levels and graduate entry. The effect size was small (<0.1) (Cohen 1988).

Table 7-7 Students' year of study and E-learning

Yr level of student	n	F1:Data searching difficult score (max score 21) Median (IQR)	E^2	X^2 (df)	p*	F2:E-learning adds value score (max score 49) Median (IQR)	E2	X^2 (df)	p*	F3:ICT is difficult & causes anxiety score (max score 14) Median (IQR)		X^2 (df)	p*
1st	159	12 (8-15)	0.001	0.54 (3)	0.911	14 (12-20)	0.014	6.50 (3)	0.090	12 (8-13)	0.011	5.10 (3)	0.17
2nd	175	12 (8-15)				17 (11-24)				12 (9-13)			
3rd	112	12.5 (8-16)				16 (12-23)				12 (9.25-14)			
Grad Entry	20	11 (8.25-13)				13 (9-21.25)				12 (10-14)			
Total	**466**	**12 (8-15)**				**15 (12-22)**				**12 (9-14)**			

Legend: *Kruskall-Wallis Test
E^2 = Effect size

7.6.4 Hypotheses related to proportion of students in full time and part time study, and E-learning

The respondent cohort contained 72% (n=336) of students who were undertaking their study full time. The following hypotheses were developed to determine whether full time or part time study impacted on the students' perceptions of E-learning.

Hypothesis 10: *Full time students will find database searching less difficult than part time students.*

Hypothesis 11: *Full time students will find E-learning will add more value than part time students.*

Hypothesis 12: *Full time students will find ICT less difficult and will cause less anxiety than part time students.*

Both full time and part time students found database searching equally difficult, and ICT equally difficult and causing equal anxiety. However, full time students were more likely than part time students to find E-learning to add value. The effect size was small (<0.1) (Cohen 1988) (see Table 7-8).

Table 7-8 Student full time and part time study and E-learning

Study	n	F1:Data searching difficult score (max score 21) Median	r	p*	F2:E-learning adds value score (max score 49) Median	r	p*	F3:ICT is difficult and causes anxiety score (max score 14) Median	r	p*
Fulltime	336	12 (7-15)	0.079	0.089	16 (12-23)	0.11	0.018	12 (10-14)	0.083	0.074
Part time	130	13 (9-15)			14 (11-19)			11 (8-14)		
Total	**466**	**12 (8-15)**			**15 (12-22)**			**12 (9-14)**		

Legend: *Mann-Whitney U Test
r = effect size

7.6.5 Hypotheses related to students with English as their second language and E-learning

English was the first language of 90.6% (n=422) of the students who completed the survey. The highest proportion of students with ESL was in the graduate entry respondents, who indicated that 20% were in this category.

The data was divided into two groups; students for whom English was their second language and students for whom English was their first language. The hypotheses tested were:

Hypothesis 13*: Students with English as their second language will find database searching more difficult than students for whom English is their first language.*

Hypothesis 14: *Students with English as their second language will be more likely to see E-learning as adding value to their learning than students for whom English is their first language.*

Hypothesis 15: *Students with English as their second language will find ICT difficult and a source of anxiety more than students for whom English is their first language*.

Student respondents with English as their second language (ESL) comprised 9% of the sample. These students found database searching less difficult than the rest of the sample, although the effect size was small (0.1) (Cohen 1988). However, no other significant differences were found between the two cohorts (see Table 7-9).

Table 7-9 Students with English as their second language

Language	n	F1:Data searching difficult score (max score 21) Median (IQR)	r	p*	F2:E-learning adds value score (max score 49) Median (IQR)	r	p*	F3:ICT is difficult and causes anxiety score (max score 14) Median (IQR)	r	p*
English	423	13 (8-15)	0.14	0.003	16 (12-23)	0.052	0.262	12 (9-14)	0.026	0.573
ESL	43	10 (6-12)			14 (11-20)			12 (10-13)		
Total	**466**	**12 (8-15)**			**15 (12-22)**			**12 (9-14)**		

Legend: * Mann-Whitney U Test
r= effect size

7.6.6 Hypotheses related to IRSD and E-learning

The data was divided into two groups; students with IRSD less than 1000 (indicating greater social disadvantage) and students with IRSD 1000 and above (indicating less social disadvantage). The rationale for dichotomising the data has been discussed in Chapter 6, section 6.7.1.3. The three hypotheses focusing on student IRSD and E-learning were:

Hypothesis 16: *Students with an IRSD below 1000 will be more likely to find database searching difficult than students with an IRSD above 1000.*

Hypothesis 17: *Students with an IRSD below 1000 will be less likely to see E-learning as adding value to their learning than students with an IRSD above 1000.*

Hypothesis 18: *Students with an IRSD below 1000 will find ICT more difficult and a greater source of anxiety than students with an IRSD above 1000.*

Hypotheses 16 and 17 were not supported. There was no statistical difference in students' ability to search the databases or in their perceptions regarding the value of E-learning. However, students with an IRSD of 1000 or greater experienced increased anxiety associated with ICT and found ICT difficult to use compared to students with an IRSD of less than 1000. The effect size on the three factors was small (<0.1) (Cohen 1988) (see Table 7-10).

Table 7-10 IRSD less than 1000 and above 1000, and E-learning

IRSD	n	F1:Data searching difficult score (max score 21) Median (IQR)	R	p*	F2:E-learning adds value score (max score 49) Median (IQR)	r	p*	F3:ICT is difficult and causes anxiety score (max score 14) Median (IQR)	r	p*
<1000	242	12 (8-15)	0.036	0.44	16 (12-23)	0.288	0.54	12 (9-13)	0.114	0.014
≥1000	224	12 (8-15)			15 (11.25-21.75)			12 (13-14)		
Total	466	12 (8-15)			15 (12-22)			12 (9-14)		

Legend: * Mann-Whitney U Test
r= effect size

7.6.7 Hypotheses related to ICT ownership, age of computers and E-learning

Previous studies have shown that the computer ownership and age of ICT devices may be related to students' CIL skills (Smith & Caruso 2010, Dahlstrom, de Boor *et al.* 2011, Dahlstrom 2012, Dahlstrom, Walker *et al.* 2013, Dahlstrom & Bichsel 2014). The Educause Center for Applied Research (ECAR) has been tracking annual desktop ownership trends in desktop computer and laptop ownership of undergraduate students in the USA since 2006 (Smith and Caruso 2010). In 2012, ECAR expanded their study globally. As shown in Table 7-11 (see p. 157), desktop and laptop ownership by nursing and midwifery students in the current study was comparable to undergraduate students who participated in the ECAR survey, with more students owning laptop computers than desktop computers

In addition to examining computer ownership, the age of desktop and laptop computers for each undergraduate year level was considered. The mean age of desktop computers was lowest amongst the second year students at 2 years (SD 2.3) and highest in the graduate entry cohort at 4 years. The mean age of laptop computers across all respondents was 3.5 years (SD 1.7).

Participants for each year level who indicated that they did not own a desktop were then matched against the ABS IRSD. Only five of the 466 students did not own either a desktop or laptop computer, and two of these five students lived in postcodes below 1000 IRSD. This indicates that for the sample, the relationship between low IRSD and computer ownership did not hold.

The data was divided into two groups; students with ICT devices less than 4 years old and students with ICT devices 4 years and older. The two groups were then analysed against the three extracted factors (see tables 7-12 and 7-13 on pages 158 and 159) to address the following three hypotheses focusing on student ICT ownership:

Hypothesis 19: *Students who have access to ICT devices older than 4 years will find database searching more difficult than students who have access to ICT devices less than 4 years old.*

Hypothesis 20: *Students who have access to ICT devices less than 4 years old will be more likely to see E-learning as adding value to their learning than students who have access to ICT devices older than 4 years.*

Hypothesis 21: *Students who have access to ICT devices more than 4 years old will find ICT difficult and a source of anxiety more than students who have access to ICT devices less than 4 years old.*

Analysis indicated that students found database searching equally difficult and that E-learning did not add value to their learning process regardless of whether they owned a desktop or a laptop, and the age of these devices. Perceptions regarding the frustration of using ICT and anxiety caused by ICT also did not differ depending on ownership or age of laptop (see tables 7-12 and 7-13). It was noted, however, that the age of student desktop computers impacted on their perception of frustration and anxiety with ICT (Table 7-12).

The relationship was further explored using Mann-Whitney U tests. A Bonferroni adjustment significance level of $p=0.0025$ showed a significant difference between the group who did not own a laptop computer and those whose computer was fours or older ($r= 0.23$, $z= -2.186$, $p=0.024$). The other significant difference occurred with participants who did not own a laptop computer and laptop computers three years old ($r= 0.22$, $z= -2.460$, $p= 0.014$). The effect size on the three factors was small (<0.1) (Cohen 1988).

Table 7-11 Computer ownership compared with ECAR results

Study	Sample size	Desktop computer ownership	Laptop computer ownership
ECAR 2010	79,420	36,454(45.9%)	66,554(83.8%)
ECAR 2011	3,000 stratified sample	1590 (53%)	2610 (87%)
ECAR 2012	10,000 representative sample	3600 (36%)	8600 (86%)
Current study	466	241 (51.7%)	409 (87.7%)
ECAR 2013	113,035	47,475 (42%)	100601 (89%)
ECAR 2014	75,000	ND	67500 (90%)

Sources: Smith & Caruso (2010), Dahlstrom, de Boor *et al.* (2011), Dahlstrom (2012), Dahlstrom, Walker *et al.* (2013), Dahlstrom & Bichsel (2014).

Table 7-12 Desktop computer age and ownership, and E-learning

Desktop Computer age & ownership	n	F1:Data searching difficult score (max score 21) Median (IQR)	E^2	X^2 (df) p*	F2:E-learning adds value score (max score 49) Median (IQR)	E^2	X^2 (df) p*	F3:ICT is difficult and causes anxiety score (max score 14) Median (IQR)	E^2	X^2 (df) p*
Don't own a desktop	225	12 (8-15)			16 (12-23.5)			12 (10-14)		
More than 4yrs old	72	13 (9-16)			17 (11.25-24)			10 (7-13)		
4yrs old	30	13 (9.75-16)			14 (12-19.25)			11.5 (7-14)		
3yrs old	35	11 (7-15)	0.012	5.63 (6) 0.47	14 (11-20)	0.008	3.52 (6) 0.742	12 (9-14)	0.034	15.76 (6) 0.015
2yrs old	48	11.5 (6.25-15)			15 (11.25-21)			12 (10-13.75)		
1yr old	18	12.5 (6.75-17)			15 (13-24)			12 (9.75-13.25)		
<1yr old	38	10.5 (6.75-14.25)			14 (10-21.25)			13 (9.75-14)		
Total	**466**	**12 (8-15)**			**15 (12-22)**			**12 (9-14)**		

Legend: *Kruskall-Wallis Test
E^2 = effect size

Table 7-13 Laptop computer age and ownership, and E-learning

Laptop Computer age & ownership	n	F1:Data searching difficult score (max score 21) Median (IQR)	E^2	X^2 (df) p*	F2:E-learning adds value score (max score 49) Median (IQR)	E^2	X^2 (df) p*	F3:ICT is difficult and causes anxiety score (max score 14) Median (IQR)	E^2	X^2 (df) p*
Don't own a laptop	57	13 (11-16)	0.012	5.61 (6) 0.47	18 (12-22.5)	0.009	4.03 (6) 0.47	10 (6-12)	0.042	19.62 (6) 0.003
More than 4yrs old	32	12.5 (7-15)			13.5 (10-21)			12 (7.75-14)		
4yrs old	28	12 (8.25-14)			15 (10.25-23.75)			11 (8-13)		
3yrs old	69	12 (7.5-16)			14 (11-23)			12 (10-13)		
2yrs old	100	12 (7-15)			15.5 (12-22.75)			12 (10-14)		
1yr old	69	11 (9-15.5)			16 (12-24)			12 (10.5-14)		
<1yr old	111	12 (7-15)			16 (12-20)			12 (9-14)		
Total	**466**	**12 (8-15)**			**15 (12-22)**			**12 (9-14)**		

Legend: *Kruskall-Wallis Test
E^2= effect size

7.6.8 Hypotheses related to student hours spent on the internet and E-learning

The mean number of hours per week that students spent on the internet for study, work or recreation was 22.4 (13.42 SD). Over a third of students (39.9%) spent more than 22 hours per week on the internet. Over a third of all year levels, with the exception of the graduate entry respondents, were spending more than 20 hours per week on the internet for study, work or recreation (see Table 7-14). These results are consistent with the 2010 ECAR data, which are the most recent data available (see Table 7-15).

Table 7-14 Approximate hours per week spent on the internet

Student Year level	Students	> 20 hours	Mean (SD)
1st yr. (n=159)	33	32.7%	20.164 (13.0)
2nd yr. (n=176)	40	43.7%	23.693 (13.9)
3rd yr. (n=112)	21	47.3%	24.179 (13.2)
Grad Entry (n=20)	7	20%	19.5 (11.1)
All (n=466)	**101**	**39.9%**	**22.44 (13.4)**

Table 7-15 ECAR 2010 Approximate hours per week spent on the internet

Hours online	Current study (n=466) Frequency of students (%)	2010 ECAR (n=28,413) Frequency of students (%)
≤10	105 (22.5)	9291 (32.7%)
11 to 20	175 (37.6)	9291 (32.7%)
21 to 40	158 (33.9)	7245 (25.5%)
≥ 40hrs	28 (6)	2585 (9.1%)
Mean (SD)	**22.44 (SD 13.42)**	**21.2 (SD Not given)**

Students born between 1977 and 1995 who grew up using ICT are regarded as the “Millennial generation” (Aviles & Eastman 2012). Such students use technology to enable connectedness with family and friends, spend over 20 hours per week online and feel comfortable undertaking a number of different tasks (Ofcom 2015). This ease with ICT use should be reflected in their perceptions of E-learning. Therefore, the following hypotheses were developed:

Hypothesis 22: *Students who spend ≥ 20 hours online will find less difficulty with database searching.*

Hypothesis 23: *Students who spend ≥ 20 hours online will be more likely to see E-learning as adding value to their learning.*

Hypothesis 24: *Students who spend ≥ 20 hours online, will have less difficulty with ICT and will feel less anxious.*

Results indicated that there was no association between the amount of time spent online per week and students' perception that E-learning added value to their learning, that ICT was difficult to use or their self-reported anxiety when using ICT. However, it was noted that students who spent more time online actually found database searching more difficult, but the effect size with all variables was small (<0.1) (Cohen 1988) (see Table 7-16)

Table 7-16 Student estimated time spent online and E-learning

Hours on the internet	n	F1: Data search-ing difficult (max score 21) Median (IQR)	r	p*	F2: E-learning adds value (max score 49) Median (IQR)	r	p*	F3: ICT is difficult and causes anxiety (max score 14) Median (IQR)	r	p*
<20	179	13 (9-16)	0.073	0.116	16 (12-23)	0.009	0.851	12 (9-13)	0.038	0.412
≥20	287	12 (7-15)			15 (12-22)			12 (9-14)		
Total	**466**	**12 (8-15)**			**15 (12-22)**			**12 (9-14)**		

Legend: * Mann-Whitney U
r=effect size

7.6.8.1 Students' use of their computers and E-learning

The researcher asked student respondents what tasks they undertook on their computer. The results indicated that over 90% of students used their computers to communicate with fellow students, friends and family members as well as their tutors/teachers. All respondents (n=466) used their computers to gather information (see Table 7-17). These results were also compared with 2011 ECAR results where possible. Results indicated that student respondents had similar usage patterns to other undergraduate students, predominantly from the USA, apart from "listening to course materials", where a larger percentage of Australian nursing and midwifery students indicated that they engaged in this activity than students in the 2011 ECAR survey (Table 7-17).

Table 7-17 Purposes for which students use their computers

Question	Yes n (%)	No n (%)	2011 ECAR Yes
Communicate with other students	433 (92.9%)	33 (7.1%)	
Communicate with family/friends	435 (93.3%)	31 (6.7%)	99%
Communicate with tutors/teachers	439 (94.2%)	27 (5.8%)	
Doing a learning task collaboratively	363 (77.9%)	103 (22.1%)	
Doing a learning task individually	462 (99.1%)	4 (0.9%)	
Gathering information	466 (100%)	0	
Listen to course materials	406 (87.1%)	60 (12.9%)	59%
Manage information	438 (94%)	28 (6%)	
Oral presentation	298 (63.9%)	168 (36.1%)	
Planning a group learning task	336 (72.1%)	130 (27.9%)	
Planning an individual learning task	418 (89.7%)	48 (10.3%)	
Read course materials	441 (94.6%)	25 (5.4%)	85%
Revise for an exam	409 (87.8%)	57 (12.2%)	
Self-assessment exercise	415 (89.1%)	51 (10.9%)	
Viewing course materials	462 (99.1%)	4 (0.9%)	85%
Writing assignments	463 (99.4%)	3 (0.6%)	
Writing a PowerPoint presentation	361 (77.5%)	105 (22.5%)	
Recording data in a spreadsheet	266 (57.1%)	200 (42.9%)	

7.6.9 Hypotheses related to student performance on Database Searching Skills (DSS) Scale

The next set of results focused on students' information literacy skills when writing an assignment. Students were asked 12 multiple choice questions that comprised the DSS Scale (see Table 7-18 next page). The results indicated that students' level of database searching skills was suboptimal. The blue highlighted areas of the table show that students struggled with database searching, including using key word searching, and truncated term and Boolean searching, with over 90% of all respondents answering incorrectly. The majority of students (93.3%) were unable to define the difference between a full text database and a citation database (see also Appendix 7b for DSS Scale results specific to Age and ESL status).

Table 7-18 Student Database searching skills (DSS) scale items

All Student information literacy n=466			
Question	**Correct answer:**	**Correct n (%)**	**Incorrect n (%)**
How would you refine (narrow) your subject/topic for an assignment?	All of the options Ask teacher Use computer database for articles Read an encyclopaedic article	6 (1.3)	460 (98.7)
What is the best way to truncate the word ECONOMICS in order to get the variant words: economically, econometrics, economy?	Econom*	36 (7.7)	430 (92.3)
The difference between a full text database and a citation database is:	A full text database includes some full text articles. The citation database includes bibliographic information about the article	31 (6.7)	435 (93.3)
Which of these keyword searches should retrieve the most results in an online database?	Dyslexia AND learning disorders	252 (54.3)	213 (45.7)
A KEYWORD search will:	Search title, contents, and subject areas	381 (81.8)	85 (18.2)
All of the following are good tips for KEYWORD searching EXCEPT:	Use very broad, general terms (i.e. animals)	221 (47.4)	245 (52.6)
You should include references in your assignment because:	All of the options References allow you to locate and read the sources yourself References give credit to authors References allow readers to determine the credibility of your sources	64 (13.7)	402 (86.3)
When using information from a Website for your assignment, an essential question to ask yourself is:	Who is the author of this info and is it accurate?	457 (98.1)	9 (1.9)
Information that you find on the internet	Comes from many varied sources such as business, the government, or private citizens	435 (93.3)	31 (6.7)
An example of a biased Website would be:	A drug company promoting a particular drug	391 (83.9)	75 (16.1)
What does '13' in the citation below signify? Ahern, N. (2005) Using the internet to conduct research Nurse Researcher 13 (2);55-70	Volume number of periodical	421 (90.3)	45 (9.7)
If you decide to use information from a Website for your research project you:	Can assume that all of the data or text is copyright	242 (51.9)	224 (48.1)

The data was divided into two groups; students who achieved 49% or less for their score on the DSS Scale and those who achieved 50% or higher. The following hypotheses focusing on student DSS were tested:

Hypothesis 25: *Students who score more than 50% on DSS will find database searching easier than students with lower DSS scores.*

Hypothesis 26: *Students who score more than 50% on DSS will be more likely to see E-learning as adding value to their learning than students with lower DSS scores.*

Hypothesis 27: *Students who score more than 50% on DSS will experience lower ICT anxiety and find ICT less difficult than students with lower DSS scores.*

The results (see Table 7-19) show that all student respondents who achieved a DSS score <50% found database searching difficult and experienced anxiety and frustration using ICT. They still perceived the value in using E-learning to the same degree as students who achieved a score of ≥ 50%. The effect size in all variables was small (<0.3) (Cohen 1988).

Table 7-19 DSS scores and E-learning

DSS Score	n	F1: Data searching difficult Max score 21 Median (IQR)	r	p	F2: E-learning adds value Max score 49 Median (IQR)	r	p	F3: ICT difficult & anxiety Max score 14 Median (IQR)	r	p
≥ 50%	398	12 (7-15)	0.214	<0.001	15 (12-22)	0.003	0.934	12 (10-14)	0.14	0.002
<50%	68	15 (12-17)			16 (11-23.75)			10 (7-12.75)		
Total	**466**	**12 (8-15)**			**15 (12-22)**			**12 (9-14)**		

Mann –Whitney U test
r=effect size

7.6.10 Overall results of the univariate analysis

Univariate analysis indicated that:

- Students with an IRSD of 1000 or greater experienced increased self-perception of frustration and anxiety when using ICT compared to students with and IRSD of less than 1000.
- Students less than 25 years of age held a more positive perception that E-learning added value to their learning than students 25 years and older.

- The students who were 25 years and older did not find ICT as difficult and a source of anxiety as those younger than 25 years old.
- Full time students were more likely than part time students to perceive E-learning as adding value to their learning.
- Students with ESL found database searching less difficult (F1) than the rest of the sample.
- Students who did not own a desktop computer and students who owned a desktop computer less than one year old perceived ICT to be more difficult and a source of anxiety than students whose desktop computer was four years or older .
- Students who spent more time online found database searching more difficult. Students who achieved greater or equal to a 50% score for their database searching skills (DSS) did not find that E-learning added value to their learning.

However, Manly (2004) noted that it is possible that multivariate analysis may uncover relationships between variables not found using univariate analyses alone. Therefore, the researcher decided to proceed with a multivariate analysis (Manly 2004).

7.7 Student multivariate analysis

Multivariate analysis was used to consider more than two variables simultaneously (Manly 2004).The researcher used multiple linear regression analyses to explore the relationship between the three identified factors (F1 “Database searching is difficult”, F2 “E-learning adds value” and F3 “Using ICT is difficult and causes anxiety”) and the following variables:

- Age
- Gender
- Index of Relative Social disadvantage (IRSD)
- ESL
- Hours online
- Database Searching Skills (DSS).

The variable “ICT ownership and age” was not included because the effect size on the three factors was small (<0.1) (Cohen 1988). Before conducting the analyses, the researcher assessed the assumptions for a multiple linear regression (Montgomery, Peck *et al.* 2012). It was noted that two of the factors, F1 “Database searching difficult” and F2 “E-learning adds value”, met the assumptions that the residuals were normally distributed, linear and homoscedastic. Also, there were no violations of the assumption of multicollinearity. However, the residuals of F3 “ICT difficult and causes anxiety” were not normally distributed (see Appendix 7c), so the data was transformed using a reflected square root transformation (reflsqrt) (Meyers, Gamst *et al.* 2006), which addressed issues regarding the assumptions.

None of the variables had missing data and no outliers were identified, based on Mahalanobis' distance and Cook's distance (Pallant 2013).

7.7.1 Multivariate linear regression results relating to F1 "Database searching is difficult"

The correlation between all variables is shown in Table 7-20.

Table 7-20 Correlations between all variables, including F1 "Database searching is difficult"

	F1	Age	Gender	IRSD	ESL	Hours on Internet	Information Literacy
F1							
Age	-0.03						
Gender	0.001	0.001					
IRSD	-0.02	-0.10	-0.07				
ESL	0.14	0.083	-0.09	0.10			
Hours on Internet	-0.07	0.09	-0.08	-0.05	-0.13		
Database Searching Skills (DSS)	-0.23	0.10	-0.04	0.07	0.04	0.08	

The results of the analyses relating to (F1) "Database searching is difficult" showed that the six independent variables account for 7.4% of the variance ($F(6,459)= 6.14$, $p<0.005$, $R2=0.074$, $R2$ adjusted=0.062). Among these six independent variables, only ESL and DSS significantly predicted F1 (see Table 7-21), with DSS contributing 0.05 to the overall variance and ESL contributing 0.02.

Table 7-21 Standardised multiple regression of the six independent variables on "Database searching is difficult"

Independent variables	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95% Confidence Interval for B		Part Correla-tions
	B	Std. Error	Beta			Lower Bound	Upper Bound	
(Constant)	16.278	4.235		3.844	.000	7.956	24.600	
Age	-0.008	0.019	-0.020	-0.447	.655	-0.045	0.028	-0.020
Q4 Gender	-0.008	0.813	0.000	-0.010	.992	-1.605	1.589	0.000
IRSD	-0.002	0.004	-0.021	-0.461	.645	-0.010	0.006	-0.021
ESL	2.190	0.729	0.138	3.004	.003	0.757	3.623	0.135
Hours on Internet	-0.011	0.016	-0.032	-0.703	.482	-0.042	0.020	-0.032
Database Searching Skills (DSS)	-0.569	0.112	-0.230	-5.059	0.000	-0.790	-0.348	-0.227

Based on these results, students who demonstrated higher DSS found less difficulty with database searching. However, the perception of difficulty with database searching was also impacted by whether English was the second language because this variable increased the perception of difficulty. It should be noted that all bivariate correlations were less than 0.3, suggesting weak relationships between these variables and F1.

7.7.2 Multivariate linear regression results relating to F2 "E-learning adds value"

The correlation between all variables is shown in Table 7-22.

Table 7-22 Correlations between all variables, including F2: "E-learning adds value".

	F2	**Age**	**Gender**	**IRSD**	**ESL**	**Hours on Internet**	**Information Literacy**
F2							
Age	-0.10						
Gender	0.11	0.001					
IRSD	-0.01	-0.10	-0.07				
ESL	0.07	0.083	-0.09	0.10			
Hours on Internet	-0.03	0.09	-0.08	-0.05	-0.13		
Database Searching Skills (DSS)	-0.08	0.10	-0.04	0.07	0.04	0.08	

The results of the analyses relating to (F2) "E-learning adds value" show that the six independent variables account for 3.5% of the variance (F(6,459)= 2.80, p<0.01, R2=0.035, R2 adjusted=0.023). Among these six independent variables, only Gender and Age significantly predicted F2 (see Table 7-23), with each variable individually contributing 0.01 to the overall variance. Based on these results, older female students were more likely to find that E-learning added value. Once again, it should be noted that all bivariate correlations were less than 0.3, suggesting weak relationships between these variables and F2.

Table 7-23 Standardised multiple regression of the six independent variables on F2: "E-learning adds value"

Independent variables	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95% Confidence Interval for B		Part Correla-tions
	B	Std. Error	Beta			Lower Bound	Upper Bound	
(Constant)	17.493	7.226		2.421	0.016	3.292	31.694	
Age	-0.072	0.032	-0.105	-2.237	0.026	-0.134	-0.009	-0.103
Q4 Gender	3.494	1.387	0.117	2.520	0.012	0.769	6.219	0.116
IRSD	-0.002	0.007	-0.013	-0.284	0.777	-.015	0.011	-0.013
ESL	2.413	1.244	0.091	1.940	0.053	-0.032	4.858	0.089
Hours on Internet	0.003	0.027	0.005	0.106	0.915	-0.050	0.056	0.005
DSS	-0.279	0.192	-0.068	-1.455	0.146	-0.656	0.098	-0.067

7.7.3 Multivariate linear regression results relating to F3 "Using ICT is difficult and causes anxiety" (reflected square root transformation)

The correlation between all variables is shown in Table 7-24.

Table 7-24 Correlations between all variables, including F3: "Using ICT is difficult and causes anxiety" (reflsqrt transformation)

	F3	Age	Gender	IRSD	ESL	Hours on Internet	Information Literacy
F3							
Age	0.25						
Gender	-0.04	0.001					
IRSD	-0.12	-0.10	-0.07				
ESL	0.03	0.083	-0.09	0.10			
Hours on Internet	-0.04	0.09	-0.08	-0.05	-0.13		
Database Searching Skills (DSS)	-0.16	0.10	-0.04	0.07	0.04	0.08	

The results of the analyses relating to (F3) "Using ICT is difficult and causes anxiety" show that the six independent variables account for 11.0% of the variance ($F(6,459)= 9.42$, $p<0.005$, $R^2=0.11$, R^2 adjusted=0.098). Among these six independent variables, Age and DSS significantly predicted F3 (Table 7-25), with Age contributing 0.07 to the overall variance and DSS contributing 0.03. Based on these results, older students found greater difficulty using ICT and were more anxious. However, this perception was also influenced by their level of DSS because the higher their DSS skills, the less difficult they perceived ICT use and the less anxious the students were about its use. It should be noted that all bivariate correlations were less than 0.3, suggesting weak relationships between these variables and F3 (reflsqrt).

Table 7-25 Standardised multiple regression of the six independent variables on "Using ICT is difficult and causes anxiety" (reflsqrt transformation)

Independent variables	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95% Confidence Interval for B		Part Correla-tions
	B	Std. Error	Beta			Lower Bound	Upper Bound	
(Constant)	3.26	0.666		4.891	0.000	1.950	4.569	
Age	0.017	0.003	0.265	5.908	0.000	0.012	0.023	0.260
Q4 Gender	-0.150	0.128	-0.052	-1.176	0.240	-0.402	0.101	-0.052
IRSD	-0.001	0.001	-0.083	-1.861	0.063	-0.002	0.000	-0.082
ESL	0.020	0.115	0.138	0.177	0.860	-0.205	0.246	0.008
Hours on Internet	-0.003	0.002	-0.008	-1.264	0.207	-0.008	0.002	-0.056
Database Searching Skills (DSS)	-0.072	0.018	-0.057	-4.050	0.000	-0.106	-0.037	-0.178

7.7.4 Summary of student multivariate analysis

The results from the multivariate analysis provide additional information about relationships between the tested variables (Age, Gender, IRSD, ESL, Hours on Internet and DSS) and the three factors being investigated (F1 "Database searching is difficult", F2 "E-learning adds value" and F3 "Using ICT is difficult and causes anxiety").

In relation to F1, students who demonstrated higher DSS found less difficulty with database searching. However, the perception of difficulty with database searching was also impacted by whether English was the second language because this variable increased the perception of difficulty. It should be noted that all bivariate correlations were less than 0.3, suggesting weak relationships between these variables and F1.

In relation to F2, older female students were more likely to find that E-learning added value. Once again, it should be noted that all bivariate correlations were less than 0.3, suggesting weak relationships between these variables and F2.

In relation to F3, older students found greater difficulty with using ICT and were more anxious. However, this perception was also influenced by their level of DSS; the higher their DSS score, the less difficult they perceived ICT use and the less anxious they were about it. It should be noted that all bivariate correlations were less than 0.3, suggesting weak relationships between these variables and F3 (reflsqrt).

The results of the qualitative content analysis of the two open response questions that formed the final part of the nursing students' E-learning questionnaire are presented in the next section.

7.8 Qualitative content analysis of student open responses

The researcher provided two opportunities for students to give open responses on how the university may better support their learning and to list the challenges they faced in their learning. The 748 responses from 260 of the 466 students were analysed using a systematic qualitative content analysis process (as described in Chapter 4, section 4.10), resulting in identification of the following content categories.

7.8.1 What enhances and what challenges students' use of E-learning?

The content analysis revealed 16 categories with the highest percentage of responses being negative towards E-learning, followed by students requesting more face-to-face teaching time. Students were aware that they needed to improve their information literacy skills and requested more opportunities to learn skills related to information literacy, such as database searching. Students also sought more tuition about using ICT, and made 67 (9.2%) comments stating that academics' ICT and information literacy skills required improvement (see Table 7-26).

Table 7-26 Student results from open responses re what enhances and what challenges your use of E-learning

Student results from open responses re what enhances and what challenges your use of E-learning (*n*=748)			
	Category	**n= number of responses in Sub category**	**Total Frequency n= number of responses (%)**
1	Negative about E-learning		113 (15)
	Sub category		
	1A Don't like E-learning	*60*	
	1B Online is isolating	*19*	
	1C Lack of motivation when studying online	*15*	
	1D Frustrated with E-learning	*11*	
	1E Want paper not computer	*8*	
2	Students want more face-to-face teaching		70 (9.4)
3	Students want to learn more about database searching		64 (8.6)
4	Wanted assistance with assignment writing		64 (8.6)
5	Students experienced ICT problems with the online site		61 (8.2)
6	Experienced difficulty with study/work/life balance		60 (8)
7	Students want to learn more ICT skills		45 (6)

8	Positive about E-learning			42 (5.8)
	Sub category			
	8A	*Increased Flexibility*	*17*	
	8B	*Online resource availability*	*25*	
9	Students realise their ICT skills are low			41 (5.6)
10	ICT is more challenging being mature aged			39 (5.2)
11	Students wanted to learn about referencing			29 (3.9)
12	Lack of access to the internet			29 (3.9)
13	Lack of quality teaching from academics			25 (3.3)
14	Academics lack skills with E-learning technology			24 (3.2)
15	ICT incompatibilities and lack of online ICT support			24 (3.2)
16	Academics are slow to reply to emails			18 (2.4)
				Total n=748 (100)

Legend: **n** reflects the total number of comments from 260 students who responded

7.9 Summary of results related to students and E-learning

The factor analysis revealed that student respondents were anxious when using ICT, found database searching difficult and did not perceive that E-learning added value to their learning. The data supported the following of the 24 hypotheses related to students and E-learning tested during the study:

- Students with an IRSD of 1000 or greater experienced increased self-perceived frustration and anxiety when using ICT compared to students with and IRSD of less than 1000.
- Students less than 25 years of age held a more positive perception that E-learning added value to their learning than students 25 years and older.
- The students who were 25 years and older did not find ICT to be as frustrating and a source of anxiety as those younger than 25 years old.
- Full time students were more likely than part time students to see E-learning as adding value to their learning.
- Students with ESL found database searching (F1) less difficult than the rest of the sample.
- Students who did not own a desktop computer and students who owned a desktop computer less than one year old perceived ICT to be more frustrating and a source of anxiety than students whose desktop computer was four years or older.
- Students who spent more time online found database searching to be more difficult.

Students who achieved greater than, or equal to, 50% on the DSS Scale did not find that E-learning added value to their learning.

Following the univariate analysis, six variables were selected for multivariate analyses to identify any relationship between them and the three identified factors. The results showed that students with English as their first language perceived less difficulty with the DSS Scale for F1 “Database searching is difficult”, and older students were more likely to perceive that E-learning added value to their studies (F2 “E-learning adds value”) and to experience greater difficulty and more anxiety with using ICT (F3 “Using ICT is difficult and causes anxiety”). If students’ DDS score was higher, they found database searching less difficult and they were also less anxious in relation to using ICT. It should be noted for all factors that all bivariate correlations were less than 0.3, suggesting weak relationships between the six variables.

Phase 2 responses to the two open ended questions revealed eight main categories that accounted for 70% of the students’ responses. These categories were:

- negative about E-learning
- wanted more face-to-face teaching
- wanted to learn more about database searching
- wanted assistance with assignment writing
- experienced ICT problems with the online university sites
- experienced difficulty with study/work/life balance
- wanted to learn more ICT skills
- positive about the flexibility and access to online resources with E-learning.

The next part of this chapter presents the Phase 2 academic results from the national online questionnaire.

PART B: ACADEMICS’ RESULTS

7.10 Academic demographic characteristics

This section covers the results from the online questionnaire that was sent to nurse academics from 19 schools of Nursing and Midwifery across Australia, representing five of the seven states and territories. A total of 212 academics from 18 of the schools responded, which reduced to 203 after the researcher made corrections for missing data, such as respondents not indicating the name of their university. Demographic information was collected for academics teaching in undergraduate nursing and midwifery curricula. The relationship between the demographic data and three identified factors from the Academic Perceptions of E-learning (APEL) Scale (F1 "E-learning adds value", F2 "Problems with E-learning" and F3 "Confident using E-learning") was then tested using the hypotheses outlined in this section. Information collected included:

- Gender
- University at which employed
- Number of years employed at university
- Fraction of employment
- Area predominantly taught (i.e. nursing or midwifery).

7.10.1 Academic response rate per university

The 203 valid responses to "university at which employed" indicated the number of responses per university as ranging from 1-41. The academic sample size of 203 respondents represented 53.3% of the known number of academics employed at the universities during the data collection period (see Table 7-27).

Table 7-27 Frequency of academic responses based on university

University	Approximate number employed (2012)	Number of responses	% response
1	15	13	86.7
2	37	13	35.1
3	33	7	21.2
4	25	10	40.0
5	30	41	137
6	No data	1	N/A
7	18	11	61.1
8	40	27	67.5
10	28	3	10.7
11	No data	11	N/A
12	28	1	3.6
13	40	21	52.5
14	16	15	93.8
15	21	4	19.0
16	13	1	7.7
17	No data	8	N/A
18	25	8	32.0
20	12	4	33.3
Missing		4	
Total	**381**	**203**	**52.3**

Data was not available regarding part time sessional staff, some of whom responded to the questionnaire. Therefore, the proportion of respondents may be an overestimate.

7.10.2 Academic participants

The majority of respondents were female and teaching on a full time basis in the nursing undergraduate curriculum. Respondents had been employed for an average of 8.7 years (SD 7.6) (see Table 7-28).

Table 7-28 Summary of Academic demographics

Academic demographic summary *n*=203				
Years employed at university	Range 12 weeks to 40 years	Mean (SD) 8.7 (7.6) years		
Gender (7 missing)	Female 175 (86.2%)	Male 27 (13.8%)		
Fraction of employment	Full time 135 (66.5%)	Part time 27 (13.3%)	Part time sessional 37 (18.2%)	Full time teaching only 7 (3.4%)
Area predominantly taught	Nursing 160 (79%)	Midwifery 13 (7.4%)		

Thirteen academics indicated that they taught predominantly in midwifery. When the two groups of academics (nursing and midwifery) were compared across the three E-learning factors from the APEL Scale (F1 “E-learning adds value”, F2 “Problems with E-learning” and F3 “Confident using E-learning” – see sections 7.11 – 7.13), no significant difference was seen between them (see Table 7-29). The effect size of all three factors was small (<0.1) (Cohen 1988).

Table 7-29 Course predominantly taught in, and E-learning factor relationship

Area of teaching	**n**	**F1: E-learning adds value (max score 63)**	**r**	**p***	**F2: Problems with E-learning (max score 28) Median**	**r**	**p***	**F3: Confident using E-learning (max score 21) Median**	**r**	**p***

		Median (IRQ)			(IRQ)			(IRQ)		
Nursing	187	44 (40-49)	0.105	0.133	15 (12-18)	0.054	0.440	12 (10-13)	0.012	0.858
Midwifery	13	45 (43.5-51)			14(10.5-17)			12 (10-13)		
Missing	3									
Totals	**203**	**44 (40-50)**			**15 (12-18)**			**12 (10-13)**		

Legend: *Mann-Whitney U Test
r=effect size

7.11 The Academic Perceptions of E-learning (APEL) Scale

This section covers the results from the APEL Scale. The Likert scale for each item's questions had seven possible responses ranging from "agree strongly" to "disagree strongly". F1 "E-learning adds value" had nine item questions, so the maximum result from F1 was 63. F 2 "Problems with E-learning" had four item questions, so the maximum result from F2 was 28. F3 "Confident using E-learning" had three item questions, with a maximum possible score of 21 (see Table 7-30).

Table 7-30 The APEL Factor scores

Factor	Median (IQR)
F1 E-learning adds value Maximum score 63	44 (40-50)
F2 Problems with E-learning Maximum score 28	15 (12-18)
F3 Confident using E-learning Maximum score 21	12 (10-13)

These results show that while academics believed E-learning added value, they experienced problems with E-learning and their confidence using E-learning was high.

7.12 Academic univariate analysis

Following the exploratory factor analysis (described previously in Chapter 6, sections 6.9.4 and 6.11), the researcher wanted to investigate relationships with the identified individual issues from Phase 1 and the literature. The researcher developed hypotheses that were used to test the issues with the identified factors F1 "E-learning adds value", F2 "Problems with E-learning" and F3 "Confident using E-learning". The following section has been constructed to provide the reader with a clear pathway for following the rationale and the hypotheses for each univariate that was analysed.

7.12.1 Hypotheses related to gender and predominant area of teaching

Academic respondents indicated that 86.2% (n=175) of them were female. All the male academics (13.8%; n=28) indicated that they taught predominantly in nursing. Only 13 (7.4%) of the academics who indicated they were female taught predominantly in midwifery, with 79% (n=160) teaching predominantly in nursing. The researcher wanted to determine whether gender impacted on the three identified factors. Therefore, she formulated the following hypotheses:

Hypothesis 28: *Academics' gender will influence the value they see in using E-learning.*

Hypothesis 29: *Academics' gender will influence their perception of E-learning being problematic.*

Hypothesis 30: *Academics' gender will influence their level of confidence when using E-learning.*

Results indicated that gender had no significant effect on the three factors (see Table 7-31) and so all three hypotheses were not supported. The effect size for all factors was small (0.2) (Cohen 1988).

Table 7-31 Academics' gender and E-learning

Gender	n	F1: E-learning adds value (max score 63) Median (IRQ)	r	p*	F2: Problems with E-learning (max score 28) Median (IRQ)	r	p*	F3: Confident using E-learning (max score 21) Median (IRQ)	r	p*
Female	175	48 (42-54)	0.063	0.369	19 (16-23)	0.068	0.33	17 (15-19)	0.12	0.094
Male	28	47.5 (41.25-52)			18.5 (15.25-22.5)			18 (16-20.75)		
Total	**203**	**48 (42-54)**			**19 (16-23)**			**18 (15-19)**		

Legend: *Mann-Whitney U Test
r= Effect size

7.12.2 Hypotheses related to years of employment and E-learning

The data was divided into two groups; academics who had been employed for 15 years or more and those employed for less than 15 years. This time frame was chosen because in October 1995, the United States Federal Networking Council (FNC) defined the term "internet" and wider access was permitted. Academics employed before 1995 would not have been working with email and the internet (Leiner, Cerf *et al.* 2012). Therefore, the following hypotheses were tested:

Hypothesis 31: *Academics employed for more than 15 years will be less likely to see value in using E-learning and its associated technology than academics employed for less than 15 years.*

Hypothesis 32: *Academics employed for more than 15 years will be more likely to experience problems using E-learning and its associated technology than academics employed for less than 15 years.*

Hypothesis 33: *Academics employed for more than 15 years will be less confident using E-learning and its associated technology than academics employed for less than 15 years.*

As seen in Table 7-32, there was no difference in how academics perceived E-learning. However, both groups indicated they were equally experiencing problems with using E-learning and its associated technology. The effect size was small (<0.2) for all factors (Cohen 1988).

Table 7-32 Years employed at university and E-learning

Years employed at university	n	F1: E-learning adds value (max score 63) Median (IRQ)	r	p*	F2: Problems with E-learning (max score 28) Median (IRQ)	r	p*	F3: Confident using E-learning (max score 21) Median (IRQ)	r	p*
<15	145	47 (42-54)	0.052	0.228	19 (16-22)	0.084	0.635	17 (14.5-19)	0.032	0.099
≥15	51	49 (43-55)			19(16-23)			18 (16-20)		
Missing	7									
Totals	**196**	**48 (42-54)**			**19 (16-23)**			**18 (15-19)**		

Legend: *Mann-Whitney U Test
r=effect size

7.12.3 Hypotheses related to Age of desktop and laptop computer

Academics were asked to estimate the age of the desktop and/or laptop computer they owned. Results showed that the mean age of academic participants' desktop computers was 3.5 (SD 2.18) years and laptop computers was 3.5 (SD 1.8) years. Interestingly, 124 (61%) academics owned a laptop computer that was up to two years old, while 50 (24.6%) did not own a desktop computer at all (see tables 7-33 and 7-34 on the following pages). The following hypotheses were developed re ownership and age of desktop and laptop computers:

Hypothesis 34: *Ownership and age of a desktop PC by an academic significantly affects how positive they are towards E-learning.*

Hypothesis 35: *Ownership and age of a laptop PC by an academic significantly affects how positive they are towards E-learning.*

Hypothesis 36: *Ownership and age of a desktop PC by an academic significantly affects how problematic they see E-learning.*

Hypothesis 37: *Ownership and age of a laptop PC by an academic significantly affects how* *problematic they see E-learning.*

Hypothesis 38: *Ownership and age of a desktop PC by an academic significantly affects how confident they feel using E-learning.*

Hypothesis 39: *Ownership and age of a laptop PC by an academics significantly affects how confident they feel using E-learning.*

The group of academics who had the lowest total score for F1 “E-learning adds value” were those who owned desktop computers that were more than 4 years old (p=0.015).

Table 7-33 Relationship between desktop age/ownership and E-learning

Desktop Computer age & ownership	n	F1: E-learning adds value (max score 63) Median (IQR)	E^2	X^2 (df)	p*	F2: Problems with E-learning (max score 28) Median (IQR)	E^2	X^2 (df)	p*	F3: Confident using E-learning (max score 21) Median (IQR)	E^2	X^2 (df)	p*
Don't own a desktop	50	47.5(42.75-53.25)				19.5 (17-22.5)				17 (14-19)			
More than 4yrs old	34	44.5 (39.75-48)				19 (16-22)				17 (15-19)			
4yrs old	12	48.5(41-56)	0.092	4.97 (5)	0.420	19 (16.5-22)	0.022	3.55 (5)	0.620	19 (16.25-20.75	0.059	10.6 (5)	0.061
3yrs old	24	49 (44.25-54)				16 (15-21)				17 (13.25-18.75)			
2yrs old	28	49.5 (42.5-56)				20 (14.25-23.75)				18 (15.25-19)			
1yr old	15	52 (48-59)				18 (17-26)				20 (17-21)			
<1yr old	40	50 (42—55.75)				20 (16-23)				18.5 (15-20)			
Total	**203**	**48 (42-54)**				**19 (16-23)**				**18 (15-19)**			

Legend: *Kruskall-Wallis Test
E^2 = effect size

Table 7-34 Relationship between laptop age/ownership and E-learning

Laptop Computer age & ownership	n	F1: E-learning adds value (max score 63) Median (IQR)	E^2	X^2 (df)	p*	F2: Problems with E-learning (max score 28) Median (IQR)	E^2	X^2 (df)	p*	F3: Confident using E-learning (max score 21) Median (IQR)	E^2	X^2 (df)	p*
Don't own a laptop	18	54(45.75-59.25)				18 (15.75-23.75)				18.5 (14-21)			
More than 4yrs old	20	48.5 (39.5-55.5)				19 (16-23.5)				18 (14.25-19)			
4yrs old	15	44(35-49)	0.048	9.68 (5)	0.088	20 (15-21)	0.029	2.88 (5)	0.734	18 (15-20)	0.025	5.27 (5)	0.400
3yrs old	26	48.5 (44.75-55.25)				20 (17-24.25)				18.5 (16-20)			
2yrs old	38	46 (41-52.25)				20 (16-23)				16.5(14-19)			
1yr old	23	48 (43-54)				18 (17-22)				17 (15-19)			
<1yr old	63	48 (42—54)				19 (16-23)				18 (15-20)			
Total	**203**												

Legend: * Kruskall-Wallis Test
E2 = effect size

7.12.4 Hypotheses related to hours spent on the internet per week

Academics were asked to estimate the number of hours they spent weekly accessing the internet for work or recreation. The mean hours spent on the internet were 21 (SD 15.6), which can be compared with the student result of 22 hours (SD 13.42). Figure 7-5 shows the distribution of Academic Hours on Internet.

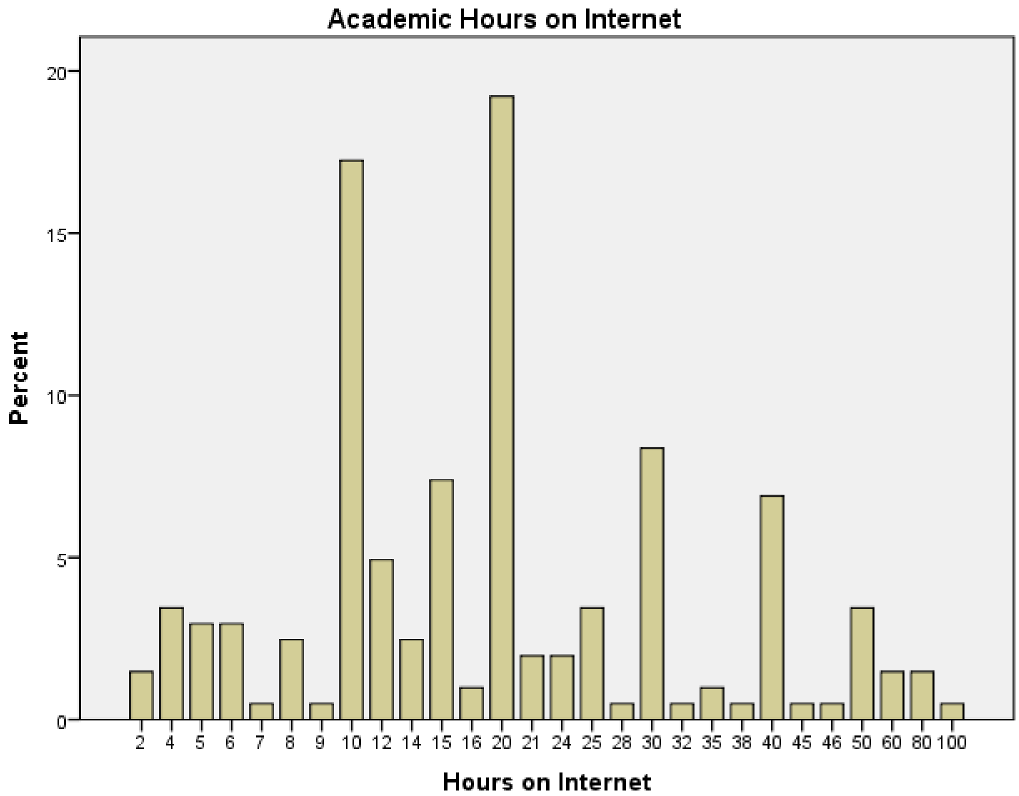

Figure 7-5 Academic Hours on Internet

(Note Outlier: 100 hours would require 14 hours per day on the internet)

The researcher correlated the data against the three factors to determine whether there was any relationship between time spent online, perceived value in E-learning, or problems using E-learning and confidence using E-learning and its associated technology. The following hypotheses were tested:

Hypothesis 40*: Academics who spend more time online per week will be more likely to see E-learning as adding value to their learning than academics who spend less than 20 hours online per week.*

Hypothesis 41: *Academics who spend less time online per week will perceive more problems with E-learning than academics who spend more than 20 hours online per week.*

Hypothesis 42: *Academics who spend less time online per week will find ICT difficult and a source of anxiety more so than academics who spend more than 20 hours online per week.*

In general, academics did not differ in their perceptions of the value of E-learning or how problematic issues were, regardless of the amount of time spent online (see Table 7-35). The effect size on all three factors was small (<0.2) (Cohen 1988).

Table 7-35 Academic hours online and E-learning

Hours online	**n= 203**	**F1: E-learning adds value (max score 63) Median (IQR)**	**r**	**p***	**F2: Problems with E-learning (max score 28) Median (IQR)**	**r**	**p***	**F3: Confident using E-learning (max score 21) Median (IQR)**	**r**	**p***
<20	97	48 (42.5-53)	0.0214	0.760	19 (16-23)	0.046	0.51	17 (14-19)	0.0863	0.219
≥ 20	106	48 (42-55.25)			19 (16-22.25)			18 (15-19.25)		
Total		**48 (42-54)**			**19 (16-23)**			**18 (15-19)**		

Legend: *Mann-Whitney U Test
r= size effect

7.13 Academic multivariate analysis

In keeping with analysis of the student data, the researcher wanted to explore the possible relationships between multiple variables and the three identified factors for the academic data. She used a linear regression analysis to explore the relationship between the following variables and all of the identified factors (F1 “E-learning adds value”, F2 “Problems with E-learning”, F3 “Confident using E-learning”):

- Years employed
- Gender
- Hours online.

The researcher assessed assumptions for a multiple linear regression prior to analysis (Montgomery, Peck *et al.* 2012). The variable “computer ownership and age” was not included because the effect size on the three factors was small (<0.1) (Cohen 1988). It was noted that two of the factors – F1 “E-learning adds value” and F2 “Problems with E-learning” – met the assumptions that the residuals were normally distributed post analysis, linear and homoscedastic. There were no violations of the assumption of multicollinearity. However, the residuals of F3 “Confident using E-learning” were not normally distributed (Appendix 7d) so the data was transformed using a reflected square root transformation (reflsqrt) (Meyers, Gamst *et al.* 2006), which addressed the issues regarding the assumption (see Appendix 7d). None of the variables had missing data, and no outliers were identified based on Mahalanobis' distance and Cook's distance (Pallant, 2013).

7.13.1 Multivariate linear regression results relating to F1 "E-learning adds value"

The correlation between all variables is shown in Table 7-36. The results of the analyses relating to (F1) "E-learning adds value" showed that the three independent variables accounted for 1.7% of the variance (F(3,192)= 1.10, p=0.349, R2=0.017, R2 adjusted=0.002). The null hypothesis that the multiple R in the population equals 0 cannot be rejected because the p value is less than 0.05 (Pallant 2013). The results of the multivariate linear regression reflected those of the ANOVA because the 95% CI for all independent variables included 0 (see Table 7-37), indicating no effect (Tabaschnik & Fidell, 2014).

Table 7-36 Correlations between all variables, including F1 "E-learning adds value"

	F1	Years Employed	Gender	Hours on Internet
F1				
Years Employed	0.01			
Gender	-0.11	0.07		
Hours on Internet	0.08	0.12	-0.07	

Table 7-37 Standardised multiple regression of the three independent variables on F1 "E-learning adds value

Independent variables	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95% Confidence Interval for B		Part Correla-tions
	B	Std. Error	Beta			Lower Bound	Upper Bound	
(Constant)	45.863	2.358		19.45	0.000	41.21	50.52	
Years Employed	0.009	0.081	0.008	0.11	0.91	-0.152	0.169	-0.008
Q4 Gender	-2.513	1.781	-0.102	-1.41	0.16	-6.025	0.999	0.101
Hours on Internet	0.041	0.040	0.074	1.03	0.31	-0.037	0.119	0.074

7.13.2 Multivariate linear regression results relating to F2 "Problems with E-learning"

The correlation between all variables is shown in Table 7-38. The results of the analyses relating to (F2) "Problems with E-learning" showed that the three independent variables accounted for 0.8% of the variance (F(3,192)= 0.52, p=0.67, R^2=0.008, R^2 adjusted=-0.007).

Once again, the null hypothesis that the multiple R in the population equals 0 cannot be rejected because the p value is less than 0.05 (Pallant 2013). The results of the multivariate linear regression reflected those of the ANOVA because the 95% CI for all independent variables included 0 (Table 7-39), indicating no effect (Tabaschnik & Fidell, 2014).

Table 7-38 Correlations between all variables, including F2 "Problems with E-learning"

	F2	Years Employed	Gender	Hours on Internet
F2				
Years Employed	-.08			
Gender	.04	.07		
Hours on Internet	-.03	.12	-.07	

Table 7-39 Standardised multiple regression of the three independent variables on F2 "Problems with E-learning"

Independent variables	Unstandardised Coefficients		Standardisee d Coefficients	t	Sig.	95% Confidence Interval for B		Part Correla-tions
	B	Std. Error	Beta			Lower Bound	Upper Bound	
(Constant)	16.475	1.372		12.008	.000	13.77	19.18	
Years Employed	-.050	.047	-.076	-1.048	.296	-.143	.044	-.075
Q4 Gender	-.456	1.036	-.032	-.440	.660	-2.499	1.587	-.032
Hours on Internet	-.007	.023	-.023	-.318	.751	-.053	.038	.023

7.13.3 Multivariate linear regression results relating to F3 "Confident using E-learning" (reflected square root transformation)

The correlation between all variables is shown in Table 7-40. The results of the analyses relating to (F3) "Confident using E-learning" showed that the three independent variables accounted for 6.1% of the variance ($F(3,192)= 4.18$, $p<0.007$, $R^2=0.061$, R^2 adjusted=0.047). However, only the independent variable "Hours on Internet" significantly predicted F3 (Table 7-41), contributing 0.03 to the overall variance. Based on these results, academics who spent more time on the internet were less confident in their use of E-learning. It should be noted that the bivariate correlation between "Hours on Internet" and F3 was less than 0.3, suggesting a weak relationship.

Table 7-40 Correlations between all variables, including F3 “Confident using E-learning” (reflsqrt transformation)

	F3	Years Employed	Gender	Hours on Internet
F3				
Years Employed	-.15			
Gender	.08	.07		
Hours on Internet	-.20	.12	-.07	

Table 7-41 Standardised multiple regression of the three independent variables on F3 “Confident using E-learning” (reflsqrt transformation)

Independent variables	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95% Confidence Interval for B		Part Correla-tions
	B	Std. Error	Beta			Lower Bound	Upper Bound	
(Constant)	2.201	.153		14.362	.000	1.90	2.50	
Years Employed	-.009	.005	-.126	-1.778	.077	-.020	.001	-.124
Q4 Gender	-.131	.116	-.079	-1.130	.260	-.359	.098	-.079
Hours on Internet	-.007	.003	-.185	-2.618	.01	-.012	-.002	-.183

7.13.4 Summary of academics and E-learning univariate and multivariate analyses

The researcher tested 15 hypotheses ten were not supported, indicating that the number of years employed, the age of the desktop or laptop computer, and the number of hours spent online per week did not have any impact on Australian nursing and midwifery academics’ level of confidence using technology, and the perceived value added by using E-learning its associated technology.

The results from the multivariate analyses provided additional information about relationships between the tested variables (years employed, gender and hours on the internet) and the three factors (F1, F2 and F3). There was no relationship between the variables and F1 “E-learning adds value”. There was no relationship between the variables and F2 “Problems with E-learning”. However, the results suggested a weak relationship (the bivariate correlation between all factors and variables was less than 0.3) between the third factor “Confident using E-learning” and “Hours on Internet”. The suggestion was that academics who spent more time on the internet were less confident in their use of E-learning.

The next section reports academic use of a variety of ICT, and a series of questions related to their level of confidence in using different ICT, willingness to use different ICT, and perceptions of support they required to use ICT and E-learning technologies as they worked.

7.14 Academic use of ICT

Academics were asked to indicate the reasons why they used ICT. Results indicated that nursing and midwifery academics reported most work use (≥90%) of the computers in areas associated with developing teaching resources (see Table 7-42).

Table 7-42 Frequencies of academics' use of a variety of ICT

Academics were asked how they used their computer n=203	Yes (%)	No (%)
Communicate with family/friends	185 (91.1%)	18 (8.9%)
Communicate with students/teachers	201 (99%)	2 (1%)
Doing a learning task collaboratively	136 (67%)	67 (33%)
Doing a learning task individually	182 (89.7%)	21 (10.3%)
Gathering information	203 (100%)	0
Developing course materials	191 (94.1%)	12 (5.9%)
Manage information	194 (95.6%)	9 (4.4%)
Oral presentation	166 (81.1%)	37 (18.2)
Planning a group learning task	175 (86.2%)	28 (13.8%)
Planning an individual learning task	173 (85.2 %)	30 (14.8%)
Writing course materials	184 (90.6%)	19 (9.4%)
Developing a written assessment	179 (88.2%)	24 (11.8%)
Writing an exam	138 (88.2%)	65 (32%)
Monitoring discussion forums	165 (81.3%)	38 (18.7%)
Updating course materials	181 (98.2%)	22 (10.8%)
Writing a PowerPoint	194 (95.6%)	9 (4.4%)
Recording data in a spreadsheet	185 (91.1%)	18 (8.9%)
Entering data into a grade management system	173 (85.2%)	30 (14.8%)
Programming High Fidelity simulation	32 (15.8%)	171 (84.2%)
Programing computer simulation	36 (17.7%)	167 (82.3%)

The majority of academics used ICT in their everyday work. At the time of data collection, few academics (17.7%) indicated that they used simulation.

7.14.1 Academic level of assistance required and willingness to use ICT

The next question drew on the *Assessing Faculty Technology Needs* (AFTN) instrument (Crews *et al.* 2009, see Chapter 6, sections 6.5.5, 6.5.6 and Appendix 6d), which provided academics with a list of 13 types of ICT (online tools) they may encounter while undertaking their work.

Academics were asked to indicate their willingness to use each type of ICT and whether they needed assistance to do so. The types of ICT were divided into three groups based on how they were thought to be used by academics. The first group consisted of ICT used in conjunction with the internet. The second group related to ICT used whilst teaching. The final group considered how willing academics were to use ICT to teach clinical skills (see Table 7-43 next page).

Results indicated that academic respondents were mixed in their willingness to use online tools. Over 60% confirmed they were comfortable and did not require additional assistance using course management systems, online lectures and audio. Over 40% responded that they were comfortable and did not require additional assistance using lectures with video and online surveys. Over 30% stated they were comfortable and did not require additional assistance using E-portfolios, instant messaging, podcasts, video streaming, and using an iPod with video. Some academics indicated they were not willing to use the listed online tools, with the highest result being over 46% not wanting to use assigned space for social networking (see Table 7-43 on next page).

7.14.2 Academic willingness to use classroom ICT

Results displayed in Table 7-44 (on page 170) show that over 70% of academics were willing to use an electronic whiteboard, with over 30% indicating that they were comfortable and did not require assistance. Over 60% indicated that they were willing to use a tablet personal computer, with over 30% indicating they did not require assistance. More than 50% of academics indicated they were willing to use a class response system (iClickers), with over 20% not requiring assistance. Over 40% were willing to use the document camera and over 30% were willing to use the interactive pen display. Table 7-44 also displays that some academics were not willing to use classroom ICT, with 19.7% (40) indicating they did not want to use the interactive pen display.

7.14.3 Academic willingness to use software tools

Results showed that academics were mostly willing to use, and comfortable using, software tools such as email (94%) and PowerPoint (87%). There were still some academics who did not want to use databases (19%) and webpage design (24%) (see Table 7-45 on page 171).

Table 7-43 Academic willingness to use 13 types of online tools and assistance required (adapted from Crews et al. (2009) Faculty Technology Needs Survey, n=197 at University of South Carolina)

Nurse academic ***n*=203**	**I want to use but need help with**	**I use, but need new ideas**	**I use and am comfortable**	**I don't want to use**	**I don't know what this is**	**This technology is not available**
Online tools	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Use Blogs	58 (28.6)	13 (6.4)	21 (10.3)	73 (36)	12 (5.9)	7 (3.4)
Use Course Management System	26 (12.8)	39 (19.2)	120 (59.1)	2 (1)	3 (1.5)	4 (2)
Use E-portfolio	63 (30.5)	21 (10.3)	55 (27.1)	28 (13.8)	22 (10.8)	4 (2)
Use Instant Messaging	18 (8.9)	10 (4.9)	49 (24.1)	88 (43.3)	3 (1.5)	6 (3)
Online Lecture & Audio	32 (15.8)	28 (13.8)	115 (56.7)	8 (3.9)	0	2 (1)
Use Lecture & Video	57 (28.1)	18 (8.9)	74 (36.5)	18 (8.9)	15 (7.4)	8 (3.9)
Use Podcast	76 (37.4)	13 (6.4)	67 (33)	24 (11.8)	4 (2)	7 (3.4)
Use Video Streaming	67 (33)	19 (9.4)	67 (33)	23 (11.3)	7 (3.4)	7 (3.4)
Use Online Surveys	58 (28.6)	19 (9.4)	86 (42.4)	18 (8.9)	6 (3)	2 (1)
Use iPod	59 (29.1)	11 (5.4)	61 (30)	42 (20.7)	6 (3)	11 (5.4)
Use iPod with Video	65 (32)	13 (6.4)	52 (25.6)	43 (21.2)	5 (2.5)	13 (6.4)
Assign space for social networking	18 (8.9)	17 (8.4)	32 (15.8)	94 (46.3)	5 (2.5)	8 (3.9)
Wikis	50 (24.6)	15 (7.4)	32 (15.8)	53 (26.1)	33 (16.3)	3 (1.5)

Table 7-44 Academic willingness to use classroom ICT (questions directly from Crews et al. (2009) Faculty Technology Needs Survey, n=197 at University of South Carolina)

Nurse academic ***n* 203**	**I want to use but need help with**	**I use, but need new ideas**	**I use and am comfortable I do not need help**	**I don't want to use**	**I don't know what this is**	**This technology is not available at my university**
Classroom tools	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Class Response System (Iclicker)	56 (27.6)	6 (3)	44 (21.6)	34 (16.7)	39 (19.2)	24 (11.8)
Document Camera	37 (18.2)	9 (4.4)	48 (23.6)	35 (17.2)	65 (32)	9 (4.4)
Electronic Whiteboard	68 (33.5)	16 (7.9)	63 (31)	22 (10.8)	15 (7.4)	19 (9.4)
Interactive pen Display	51 (25.1)	5 (2.5)	17(8.4)	40 (19.7)	62 (30.5)	28 (13.8)
Tablet PC	45 (22.2)	13 (6.4)	70 (34.5)	27 (13.3)	18 (8.9)	30 (14 8)

Table 7-45 Academic level of assistance required using software tools (adapted from Crews et al. (2009) Faculty Technology Needs Survey, n=197 at University of South Carolina)

Nurse academic n=203	I want to use but need help with	I use, but need new ideas	I use and am comfortable I do not need help	I don't want to use	I don't know what this is
Software tools	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Databases	39 (19.2)	14 (6.9)	87(42.9)	39 (19.2)	15 (7.4)
Email	0	9 (4.4)	190 (93.6)	3 (1.5)	0
PowerPoint	2 (1)	20 (9.9)	177 (87.2)	2 (1)	1 (0.5)
Screen Voice Capture	50 (24.6)	11 (5.4)	68 (33.5)	13 (6.4)	48 (23.6)
Spreadsheet	29 (14.3)	35 (17.2)	135 (66.5)	3 (1.5)	1 (0.5)
Web Page Design	75 (36.9)	8 (3.9)	30 (14.8)	49 (24.1)	29 (14.3)

7.14.4 Academic willingness to use ICT with a clinical focus

The researcher wanted to determine the willingness of nursing and midwifery academics to use a variety of ICT that would be found in the practice laboratories where students can practise skills on mannequins before they carry out the skill on patients whilst on placement. Results showed that over 65% (n=150) of academics were willing to use clinically-focused ICT. Results also showed that 20% (n=41) of academics did not want to use high fidelity simulation. A similar number 23% (n=46) did not want to use the ECG trainer (see Table 7-46). It was not possible to correlate these results with the topics in which the academics taught because that data was not collected.

Table 7-46 Academic willingness to use 7 types of Clinical skills ICT

Nurse academic *n*=203	**I want to use but need help with**	**I use, but need new ideas**	**I use and am comfortable I do not need help**	**I don't want to use**	**I don't know what this is**	**This technology is not available at my university**
Clinical skill ICT	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
High Fidelity Simulation.	61 (30)	16 (7.9)	58 (28.6)	41 (20.2)	16 (7.9)	11 (5.4)
Computer Manikins.	54 (26.6)	22 (10.8)	80 (38.9)	34 (16.7)	7 (3.4)	7 (3.4)
Advanced life support (ALS) Manikins.	59 (29.1)	18 (8.9)	72 (35.5)	40 (19.7)	3 (1.5)	11 (5.4)
ECG Trainer.	47 (23.2)	14 (6.9)	74 (36.5)	46 (22.7)	8 (3.9)	14 (6.9)
Computer programmable Trainers.	68 (33.5)	8 (3.9)	61 (30.1)	28 (13.8)	21 (10.3)	17 (8.4)
IV pumps.	16 (7.9)	10 (4.9)	138 (68)	32 (15.8)	6 (3)	1 (0.5)
Self-Directed Computer based Pt. Scenarios.	72 (35.5)	8 (3.9)	64 (31.5)	30(14.8)	19 (9.4)	10 (4.9)

7.15 ICT professional development offered at academics' university

The next part of the analysis focused on the different ways professional development was being delivered to the academics. The researcher wanted to determine what options for receiving professional development were currently being offered to academics. Results showed that at the time of data collection, professional development occurred most frequently in the form of written web-based resources 179 (88%). Professional development offered by online asynchronous meetings was the least frequently used, with 178 (88%) academics indicating their university did not offer this option (see Table 7.47).

Table 7-47 ICT Professional development offered to academics by their university

Academic n=203	Yes (%)	No (%)
Staff Development Group Sessions (brainstorming)	123 (60.6)	80 (39.4)
Staff Development by CD or DVD (self-paced training)	64 (31.5)	139 (68.5)
Staff Development by Online Synchronous meetings	34 (16.7)	169 (83.3)
Staff Development by Online Asynchronous meetings	25 (12.3)	178 (87.7)
Staff Development One-time events (faculty forums by experts in the field)	157 (77.3)	46 (22.7)
Staff Development Face-to-face sessions	136 (67)	67 (33)
Staff Development Streaming Video (internet-based training)	130 (64)	73 (36)
Staff Development Written web-based resources	179 (88.2)	24 (11.8)

7.15.1 Effectiveness of receiving ICT-related professional development

There are many ways in which professional development can be delivered. The researcher wanted to determine how helpful eight selected ways of delivering ICT-focused professional development were as determined by the academics' responses.

Results showed that 160 (78.8%) of the academics found face-to-face professional development sessions extremely effective. The academics perceived the least helpful way of receiving professional development related to ICT was through online synchronous and asynchronous meetings (see Table 7-48).

Table 7-48 Effectiveness of professional development delivery related to ICT

Nurse academic n=203	Professional Development Group Sessions (brainstorming) n (%)	Professional Development by CD or DVD (self-paced training) n (%)	Professional Development by Online Synchronous meetings n (%)	Professional Development by Online Asynchronous meetings n (%)	Professional Development One-time events (faculty forums by experts in the field) n (%)	Professional Development Face-to-face sessions n (%)	Professional Development Streaming Video (internet based training) n (%)	Professional Development Written web-based resources n (%)
Extremely helpful	44 (21.7)	36 (17.7)	16 (7.9)	12 (5.9)	42 (20.7)	49 (24.1)	40 (19.7)	36 (17.7)
Helpful	108 (53.2)	107 (52.7)	44 (21.7)	33 (16.3)	106 (52.2)	111 (54.7)	109 (53.7)	118 (58.1)
Somewhat helpful	38 (18.7)	37 (18.2)	22 (10.8)	35 (17.2)	42 (20.7)	26 (12.8)	37 (18.2)	38 (18.7)
Not helpful	8 (3.9)	15 (7.4)	37 (18.2)	40 (19.7)	8 (3.9)	11 (5.4)	9 (4.4)	8 (3.9)

7.16 Qualitative content analysis of open responses

The researcher provided two open response questions for the academics (n=203). The first question asked academics to provide any suggestions about how the university could enhance their teaching. The second asked academics to list any challenges they faced in their teaching. A total of 297 units of analysis were identified from the two responses. All responses were analysed using suggested six step content analysis processes outlined by Zhang and Wildemuth (2009). As outlined previously in Chapter 4, the six steps undertaken were:

- preparation of the data
- identification of the unit of analysis
- identification of the categories and the coding schemes
- coding all of the text
- assessing the coding for consistency
- conclusions and searching for meaning.

Results revealed that academic respondents felt their teaching would be enhanced if the university provided time to develop skills and resources, implement developed resources and keep pace with ICT innovations (see Table 7-49).

Table 7-49 Academic results from open response questions

All Academic results from open responses: what enhances and what challenges your use of E-learning? n=297 (%)					
Category			**n=response from Sub categories**		**Total n (%)**
1	Lack of leadership & infrastructure in E-learning				96 (32.3)
	1A	Lack of leadership in E-learning		71	
	1B	Barriers to E-learning innovation		25	
		1 ICT incompatibilities	*9*		
		2 Lack of ICT in classrooms	*5*		
		3 Lack of recognition of excellence in E-learning	*3*		
		4 Lack of online resources	*4*		
		5 Lack of consistency across staff using E-learning	*4*		
2	E-learning requires more time				84(28 3)
	2A	Lack of Time		21	
	2B	More Time to learn new E-learning technology		28	
	2C	More Time to develop resources		18	
	2D	More Time to ensure quality of resources		10	
	2E	More Time to practice before teaching with E-learning technology		7	

3	Academics want professional development	59 (20)
4	Student's low CIL skills impact on E-learning	27 (9)
5	E-learning increases academic's workload	25 (8.4)
6	Want more face-to-face teaching	6 (2)
		Total n=297 (100)

Legend: ***n*** reflects the total number of comments from academics

7.17 Summary

The two parts of this chapter have clearly presented all results from both the student and academic questionnaires. This section summarises the major results, then introduces the next chapter.

The majority of the 27 hypotheses generated during the univariate analysis of the results for the student respondents were not upheld, while those that were upheld were based on significant but weak relationships between the variables and the three factors analysed in the SPEL Scale. The nine hypotheses that were upheld were:

- Students with an IRSD of 1000 or greater experienced increased self-perception frustration and anxiety when using ICT compared to students with and IRSD of less than 1000.
- Students less than 25 years of age held a more positive perception that E-learning added value to their learning than students 25 years and older.
- The students who were 25 years and older did not find ICT to be as frustrating and a source of anxiety as those younger than 25 years old.
- Full-time students were more likely find E-learning as adding value to their learning than part-time students.
- Students with ESL found database searching (F1) less difficult than the rest of the sample.
- Students who did not own a desktop computer and students who owned a desktop computer less than one year old perceived ICT to be more frustrating and a source of anxiety than students whose desktop computer was four years or older .
- Students who spent more time online found database searching to be more difficult. Students who achieved greater or equal to 50% score for their Database searching skills did not find that E-learning added value to their learning.

The only large effect size was for the hypothesis that male students had a more positive perception about the value that E-learning added to their studies.

Analysis of the open ended question responses identified that students:

- were negative about E-learning
- wanted more face-to-face teaching
- wanted to learn more about database searching
- wanted assistance with assignment writing
- experienced ICT problems with the online university sites
- experienced difficulty with study/work/life balance
- wanted to learn more ICT skills
- were positive about the flexibility and the access to online resources with E-learning.

In the academic side of the study, none of the 15 hypotheses generated were upheld using the APEL Scale, indicating no impact of any of the variables on Australian nursing and midwifery academics' level of confidence using E-learning and its associated technology, or the perceived value added by E-learning. The academics' open ended question responses highlighted their need for more time to develop E-learning skills and resources, to implement them and to keep pace with ICT innovations. Academics' responses also highlighted their preference for, and perceived effectiveness of, face-to-face professional development sessions.

In both the student and academic multivariate analyses that followed the univariate analyses, all bivariate correlations between all variables and factors were less than 0.3, suggesting only weak relationships.

The next chapter details the integration of Phase 1 and Phase 2 of the study from the initial study design stage to integration of the two data sets (students and academics).

Chapter 8 Integration of Phase 1 and Phase 2 Results

8.1 Introduction

This chapter begins with a brief overview of how the researcher has used integration throughout this mixed methods study. The overview covers the research design, the methods used and how the researcher has integrated the resulting themes from the qualitative Phase 1 with the quantitative Phase 2 statistical results.

The next part of the chapter explains how the researcher used integration through a narrative process, as described by Fetters *et al.* (2014), to integrate the Phase 1 qualitative themes with the Phase 2 quantitative results. The new data set achieved following the integration is presented, supported by joint displays of Phase 1 and Phase 2 results.

8.2 Integration at the study design stage

The current exploratory, sequential, mixed methods qualitative then quantitative study used integration at the study design stage. In this type of mixed methods design, the researcher first collected and analysed qualitative data. These findings from this analysis informed the Phase 2 quantitative data collection (Onwuegbuzie & Combs 2010). Themes derived from the student and academic focus groups guided the development of the student and academic questionnaires used in Phase 2. Figure 3-2 in Chapter 3 illustrates where integration fits in this study's eight step mixed methods research design.

8.3 Integration at the methods stage

Creswell and Plano Clark (2011) suggest that integration is achieved at the methods level of a study by linking the data collection and analysis methods. Linking can occur in several ways: 1, *connecting*; 2, *embedding;* 3, *merging;* and 4, *building* (Creswell & Plano Clark 2011).

Linking though *connecting* can occur when one type of data links with another. For example, the researcher collects data via a questionnaire, then interviews a sample of the respondents. The second type of linking, *embedding*, occurs when the data collection and analysis are linked at multiple points. This is important in advanced studies. An example would be where a team of researchers shared data collection and analysis during the data collection in a large study. Integration through *merging,* the third type of linking suggested by Creswell and Plano Clark (2011), occurs when the researcher brings together the two databases for analysis and comparison. Both types of data collection strategies should be conducive for merging if this is to occur easily. An example would be that qualitative questions would be similar to the types of items in the scales used in the quantitative instruments. The current study used integration through *building*, the fourth method of linking, which occurs when results from one data collection procedure inform the data collection from different phases of a study, in this case from Phase 1 through to Phase 2 (Creswell & Plano Clark 2011).

8.3.1 Integration at the interpretation and reporting of results level

Following data collection and analysis, the integration of qualitative and quantitative data at the interpretation and reporting level occurred in three ways: integration through *data transformation*; integration through *narrative;* and integration through *joint displays* (Creswell & Tashakkori 2007, Fetters, Curry *et al.* 2013). The current study used integration through *data transformation,* and a *narrative* method supported by *joint displays*. The researcher's pragmatic outlook in relation to the integration of qualitative and quantitative data is summarised well in the following quote:

> From data in the form of numbers, one makes inferences in the same way as with data in the form of words, not by virtue of probabilistic algorithms. Statistics are not privileged. Inference is not mechanised. With this way of viewing knowledge, "mixed" methods may even be a misnomer, as both surveys and participant observation yield equivalent data. Inferences are based on the inquirer's coordinating multiple lines of evidence to gain an overall understanding of the phenomenon . . . Yet, because the inquirer is the instrument, all information flows through a single perspective . . . the standard of a valid account rests on establishing coherence across multiple lines of evidence and argument. (Smith 1997, p. 77)

8.3.1.1 Integration through data transformation: Quantification of qualitative data

When the researcher was considering Phase 1 qualitative data, the terms and phrases were read iteratively and then counted as the first part of the descriptive process as a precursor to analysis (Sandelowski 2001, Bazeley 2009). The researcher only counted the number of participants who mentioned a particular phrase as opposed to one participant mentioning the same phrase many times, as well as noting the context in which the phrase was used (Bazeley 2009). She was aware that the aim with counting as a way to identify patterns in the narrative also required her to reflect on the narrative passage to understand the whole message in the "sense of controlled Fremdverstehen" (understanding the other) (Kuckartz 1995: 158). The quantitising of the qualitative data is not the end of the process; instead, it is seen as a way of adding power and sensitivity to individual judgement when describing patterning in a set of observations (Weinstein & Tamur 1978). The researcher calculated the Phase 1 qualitative data with the percentage of the whole data set alongside it for the student and then the academic focus group findings (see Table 8-1 and Table 8-2). The percentage provided the researcher with an appreciation of the strength of that particular finding in relation to the other findings.

Table 8-1 Phase 1 qualitative student findings

Phase 1 Students (n=27), total number of narrative quotes (n=44)	Frequency	Percentage
Students were negative about E-learning	**Total 27**	**61.3**
Low CIL skills	8	18.1
Fear when using computers	6	13.6
Frustration	5	11.3
Accessing library resources	5	11.3
Online enrolment process	3	6.8
Students were positive about E-learning	**Total 17**	**38.6**
Connected to other students	4	9
Learning	8	18.1
Less travel	3	6.8
Flexibility	2	4.5

Table 8-2 Phase 1 qualitative academic findings

Phase 1 academic (n=25), total number of narrative quotes (n=119)	Frequency	Percentage
Academics were negative about E-learning	**Total 83**	**69.7**
Lack of ICT facilities	14	11.7
Depth of student learning	14	11.7
Lack of time	14	11.7
Technology out of date	13	10.9
Resistance to using E-learning	12	10
Equity for students	8	6.7
Frustration	8	6.7
Academics were positive about E-learning	**Total 21**	**Total 17.6**
Increase in reality-based teaching	6	5
Accommodating learning styles	6	5
Flexibility for students	5	4.2
Organising teaching resources	4	3.3
Professional development (PD)	**Total 15**	**Total 12.6**
Need E-learning PD	5	4.2
Information not retained	4	3.3
Tailored PD required	4	3.3
Nurse academics are the content experts	2	1.6

8.3.1.2 Integration through data transformation: Qualitisation of numerical data

The researcher transformed the quantitative data into narrative form by using the three named factors and the categories developed from the content analysis for the open response questions in the two Phase 2 questionnaires (instruments). She used the distribution of numeric data for a single variable and then generated separate narrative categories based on the sub-ranges of values within that distribution. The results were profiled into categories based on the participants' responses (Sandelowski 2003, Tashakkori & Teddlie 2009). The Phase 2 qualitised data from the students and the academics is presented in tables 8-3 and 8-4.

Table 8-3 Phase 2 student qualitised data

Phase 2 student qualitised data: The Student Perceptions of E-learning Scale (SPEL) n=466 respondents		
Median (IQR)	**Maximum score**	**Factor name**
12 (8-15)	21	F1 Database searching difficult.
15 (12-22)	49	F2 E-learning adds value
12 (9-14)	14	F3 ICT Difficult and causes anxiety.

Open response content analysis categories n=748 comments		
Frequency (%)	**n=comments**	**Category name**
15	113	1. Negative about E-learning
		Sub category
	60	*1A Don't like E-learning*
	19	*1B Online is isolating*
	15	*1C Lack of motivation when studying online*
	11	*1D Frustrated with E-learning*
	8	*1E Want paper not computer*
9.4	70	2. Students want more face-to-face teaching
8.6	64	3. Students want to learn more about database searching
8.6	64	4. Wanted assistance with assignment writing
8.2	61	5. Students experienced ICT problems with the online site
8	60	6. Experienced difficulty with study/work/life balance
6	45	7. Students want to learn more ICT skills
5.8	42	8. Positive about E-learning
		Sub category
	17	*8A Increased Flexibility*
	25	*8B Online resource availability*
5.8	41	9 Students realise their ICT skills are low
5.2	39	10 ICT is more challenging being mature aged

Table 8-3 continued

Open response content analysis categories n=748 comments		
Frequency (%)	**n=comments**	**Category name**
3.9	29	11 Students wanted to learn about referencing
3.9	29	12 Lack of access to the internet
3.3	25	13 Lack of quality teaching from academics
3.2	24	14 Academics lack skills with E-learning technology
3.2	24	15 ICT incompatibilities and lack of online ICT support
2.4	18	16 Academics are slow to reply to emails

Table 8-4 Phase 2 academic qualitised data

Phase 2 academic qualitised data: The Academic Perception of E-learning Scale (APEL) n=203 respondents		
Median (IQR)	**Maximum score**	**Factor name**
44 (40-50)	63	F1. E-learning adds value
15 (12-18)	28	F2. Problems with E-learning
12 (10-13)	21	F3. Confident using E-learning

Open response content analysis categories n=297 comments		
Frequency (%)	**n=comments**	**Category name**
32.3	96	1. Lack of leadership and infrastructure in E-learning
		Sub category
	71	*1A Lack of leadership in E-learning*
	25	*1B. Barriers to E-learning innovation*
	9	*1 ICT incompatibilities*
	5	*2 Lack of ICT in classrooms*
	3	*3 Lack of online resources*
	4	*4 Lack of consistency across staff using E-learning*
	3	*5 Lack of recognition of excellence in E-learning*
28.3	84	2. E-learning requires more time
	21	*2A. Lack of Time*
	28	*2B More Time to learn new E-learning technology*
	18	*2C More Time to develop resources*
	10	*2D More Time to ensure quality of resources*
	7	*2E More Time to practice before teaching with E-learning Technology*

Table 8-4 continued

Open response content analysis categories n=297 comments		
Frequency (%)	**Frequency (%)**	**Frequency (%)**
20	59	3. Academics want professional development
9	27	4. Student issues impact on E-learning e.g. low CIL skills
8.4	25	5. E-learning increases my workload
2	6	6. Want more face–to-face teaching

8.3.1.3 Integration through joint displays

The researcher used a method of joint display that provided the reader with a clear way of comparing the qualitative Phase 1 narrative findings and the quantitative Phase 2 statistical findings. Creating a visual interpretation of the research data provides a powerful channel for information exchange (Dickinson 2010). Independently, the qualitative and quantitative data have yielded important information, but they have not been able to generate the complete and overall Gestalt of meaning. Both the narrative themes and the numeric data benefit from visual display, which increases communication of findings and enhances pattern recognition (Dickinson 2010).

The next section describes the generation of the display of the integrated data resulting from the Phase 1 qualitative themes with selected participant narratives and Phase 2 quantitative data.

8.4 Integration of the Phase 1 and Phase 2 data sets

The rationale for quantitising the Phase 1 qualitative findings in addition to qualitising the Phase 2 quantitative findings was to allow the researcher to see the trends in both data sets and to enhance validity by highlighting overlapping aspects of the phenomenon (undergraduate nursing students' and academics' use of E-learning in Australia). The researcher was able to use findings from Phase 1 to elaborate and support results from Phase 2 (Weiss, Kreider *et al.* 2005, Bazeley 2011).The process of integration involved the researcher moving iteratively between the Phase 1 and Phase 2 results, and formulating the integrated findings based on the highest frequency of occurrence of a finding in relation to the data as a whole.

In the following sub-sections, the researcher presents the student data followed by the academic data, and displays each integrated finding as a table for clarity.

8.4.1 Integrated student data

The researcher integrated the thematic findings from the Phase 1 qualitative focus group data with the Phase 2 analysed quantitative survey data to produce four integrated student findings:

1. Students had difficulty with database searching and wanted to learn database searching skills.
2. Few students were positive about E-learning.
3. Students had low computer literacy skills but wanted to learn ICT skills.
4. Students experienced frustration and anxiety using computers.

8.4.1.1 Students had difficulty with database searching and wanted to learn database searching skills

This was the most strongly emphasised integrated finding in both sets of data. Student comments from Phase 1 were based around difficulties they experienced trying to undertake database searching to access information for their assignments. The Phase 2 data also supported this finding. F1 “Database searching difficult” accounted for 27.8% of the variance. The questionnaire also asked students to answer 12 questions associated with skills required for database searching. The mean of 7.5 (SD 1.9) indicated that just under half of the 466 respondents answered the questions incorrectly. The open responses in the questionnaire, in which students indicated they needed courses in database searching skills (8.6%, n=64), further confirmed these results. Table 8-5 (next page) displays the evidence for this integrated finding.

8.4.1.2 Few students were positive about E-learning

The Phase 1 qualitative data displayed 12 (44%) quotes from students in the focus group discussions. Students expressed how much they enjoyed the flexibility and connectedness they felt from being able to access their studies away from the university campus (see Chapter 5, section 5.4). The factor analysis from Phase 2 of the study found that the second factor, F2 “E-learning adds value”, explained 21.8 % of the variance. The open responses from the Phase 2 survey revealed that 5.8% (n=42) of the responses indicated that students wanted more E-learning. Table 8-6 (on page 186) displays the evidence for this integrated finding.

Table 8-5 Student Integrated finding 1: Students had difficulty with database searching and wanted to learn database searching skills

Student Phase 1 Sub-theme Frequency n=27 (%)	**Narrative examples**	**Phase 2 Finding n=466**	**Phase 2 open responses category n=748 (%)**	**Integrated finding**
Low levels of CIL (32) Difficulty accessing library resources (18.5)	**Student 7: *I'm lost with that [library website], I just don't understand how to do it, I'm aware there are journals and articles and things but I don't know how to access them* (FGS2).** **Student 26: *I wish the Uni.*[library] *wouldn't even link me to those, I think it's* [database] *or something and I'm like why do you send me there if I can't access the article anyway?* (FGS5).** Student 13*: I've got a feeling with the database and searching articles I might actually get through this whole degree without actually learning how to use it* (FGS3). Student 17*: They* [the Library databases] *are not user friendly, it's really confusing and because we were accredited in the second year* [commenced their studies in second year] *and we missed the first year of how to go about searching databases and stuff… Still struggling, it's not easy to get the articles* (FGS4).	Factor 1 Data searching difficult. Median 12 (IQR 8-15) (Maximum score 21) Item: Sum of 12 Information literacy questions. Mean 7.5 (SD1.9) (Maximum score 12)	1. Negative about E-learning 113 (15) 3. Students want to learn more about database searching 64 (8.6)	1. Students had difficulty with database searching and wanted to learn database searching skills

Table 8-6 Student Integrated finding 2: Few students were positive about E-learning

Student Phase 1 Sub-theme Frequency n=27 (%) Number of responses	Narrative examples	Phase 2 Finding n=466	Phase 2 open responses category n=748 (%)	Integrated finding
Students were positive about E-learning (68)	**Student 13: *I think LMS is really good, it makes me feel really connected to the university when I'm not here and pretty much most of your questions are answered if you read it all .... I don't feel isolated; I haven't asked one question, it all unfolds slowly* [on the online discussion forum] *if you keep up with it* (FGS3).** Student 25: *I love LMS, I learn a lot, I know what I'm doing, I go in* [access the LMS] *the morning and in the afternoon I have to go and check especially when students talk to each other* [on discussion forums]*. … I come to Uni. only once a week and it's not enough and for the rest of the week I know I'm right. I love it. …* [LMS is] *very good, for microbiology I remember I went through it every night… now can you do it by yourself even if you get all the books ready but you don't know where to start* (FGS5).	Factor 2: E-learning adds value. Median 15 (IQR 12-22) (Maximum score 49)	Positive about E-learning including increased flexibility 42 (5.8%)	2. Few students were positive about E-learning

8.4.1.3 Student respondents had low computer literacy skills and wanted to learn ICT skills

Findings from Phase 1 focus group thematic analysis revealed students were struggling with the level of ICT skills required to study at tertiary level. These comments from the focus groups were supported by the third factor, F3 “ICT difficult and causes anxiety”, which was identified through maximum likelihood analysis and explained 8.4% of the variance. The open responses from the questionnaire also revealed that students acknowledged their need to improve their ICT skills (6%, n=45) and database searching skills (8.6%, n=64), which were not being provided (see Table 8-7, next page).

8.4.1.4 Students experienced difficulty, frustration and anxiety using computers

This fourth integrated finding was strongly supported from students in the focus groups who provided 41% (n=11) of the 97% (n=26) of negative comments about E-learning. The narrative comments were supported by F3 “ICT is difficult and causes anxiety”, which was identified through exploratory principal component analysis of the 466 valid returned questionnaires. F3 accounted for 8.4% of the total 58% of the variance. The open responses from the questionnaire provided additional support, with 16.7% (n=201) indicating that they did not like E-learning and wanted more face-to-face time with staff in the classroom (see Table 8-8 on page 189).

Table 8-7 Student Integrated finding 3: Students had low computer literacy skills but wanted to learn ICT skills

Student Phase 1 Sub-theme Frequency n=27 (%)	**Narrative examples**	**Phase 2 Finding n=466**	**Phase 2 open responses category n=748**	**Integrated finding**
1. Low level of computer literacy skills (CIL) 2. Online enrolment difficult 3. Difficulty accessing library resources. Total (59)	**Student 20: *...they [other students] don't actually know it* [CIL] *and so it's not necessarily that the technology is bad it's just that we've been poorly informed or poorly educated about how to use it* (FGS4).** Student 8: *And that's the thing, it goes back to your computer and your knowledge and then like I said before you're stressed anyway so you think oh well have some chocolate and turn it off* (FGS2). **Student 11:*... then when they said to me 'you need to enrol online and then you need to register in topics and then register in classes' and I went 'what', So I think if you've got more computer skills it might not be so daunting* (FGS3).** Student 11: *it's so overwhelming starting a university course and especially if you're computer challenged, you're trying to deal with IT stuff and just getting that into your head and then you've got all this other stuff being thrown at you and some of it kind of goes by the way side. I don't know whether there should be a workshop or something using the technology or what's expected* (FGS3).	Factor 1: Data searching difficult. Median 44 (IQR 40-50) (Max. score 21) Item: I would find it easier if I knew more about computers. Mean 4.6 (SD 1.98) (Max. score 7).	3. Students wanted to learn about referencing 64 (8.6%) 7. Students want to learn more ICT skills 45 (6%) 9. Students realise their ICT skills are low 41 (5.6%) 10. ICT is more challenging being mature aged 39 (5.2%)	3. Students had low computer literacy skills but wanted to learn CIL skills

Table 8-8 Student Integrated finding 4: Students experienced frustration & anxiety using computers

Student Phase 1 Theme Frequency n=27 (%)	**Narrative examples**	**Phase 2 Finding n=466**	**Phase 2 open responses category n=748 (%)**	**Integrated finding**
Students were negative about E-learning Frustration Fear/Anxiety Total (78)	Student 11: *I get very frustrated when things don't work the way they should, so the university says we want you to use this technology, I use that technology, don't have a problem with that, and you go to use it and you could lose the will to live waiting for it to respond, and it's not always just your connectivity time, it's quite often that there are issues with, like LMS* (FGS3). Student 6: *But you've been using computers obviously prior to coming to university haven't you?* Student 9: *Nothing like LMS, I was terrified (FGS2).* **Student 11: *Personally the computer side of things kind of freaked me out, I was lost, completely lost, so it was a little bit overwhelming in that respect. So I think if you've got more computer skills it might not be so daunting* (FGS3).**	Factor 3: ICT difficult & causes anxiety. Median 12 (IQR 9-14) (Maximum score 14)	Students want more face-to-face teaching 70(9.4%) Students experienced ICT problems with the online site 61 (8.6%) Students experienced lack of access to the internet 29 (3.9%) Academics lack skills with E-learning technology 24 (3.2%) ICT incompatibilities and lack of online ICT support 24 (3.2%)	Students experienced frustration & anxiety using computers

8.4.2 Integrated academic data

The researcher integrated the thematic findings from the Phase 1 qualitative focus group data with the Phase 2 analysed quantitative questionnaire data and generated five integrated academic findings:

1. E-learning infrastructure and leadership in E-learning varied in schools of Nursing and Midwifery across Australia.
2. Academics lacked time to develop and incorporate E-learning into their teaching.
3. Academics wanted professional development related to ICT and E-learning technologies and pedagogies.
4. Academics experienced frustration using ICT and its associated technology
5. Academics were confident using E-learning and felt it added value.

8.4.2.1 E-learning infrastructure and leadership in E-learning varied in schools of Nursing and Midwifery across Australia

The Phase 1 academic focus group negative comments about the lack of teaching resources were equally as strong as the positive comments about E-learning (n=17, 68%). Academics expressed concern and frustration about the lack of appropriate, up-to-date resources to enable them to effectively use E-learning and its associated technology in their teaching.

Phase 2 factor analysis supported the Phase 1 findings, with the second factor, F2 “Problems with E-learning”, explaining 9.8% of the variance. The open responses from the academics further supported the Phase 1 findings with the sub-category *Barriers to E-learning innovation (8.4%, n=25),* within which academics found that *ICT incompatibilities, lack of ICT in classrooms and lack of online resources* impacted on them (see Table 8-9, next page).

8.4.2.2 Academics lacked time to develop and incorporate E-learning into their teaching

This second academic integrated finding comes from academics in the focus groups in Phase 1 discussing how time consuming was the development and delivery of E-learning resources (11 comments = 44%). The items in the second factor, F2 “Problems with E-learning”, included questions that focused on time – item “There is not enough time to develop E-learning resources”, with a maximum score of 7 and mean of 3 (SD 1.67); and item “There is not enough time to incorporate computer and web-based education into the subjects I teach”, with a maximum score of 7 and a mean of 4.1 (SD 1.8).

Additional strong support for this integrated finding was evident in the open response content analysis with the category, *E-learning requires more time* (28.3%, n=84). This category was further divided into five sub-categories where academics indicated they required more *time to learn new E-learning technology, develop resources, ensure quality of resources,* and *practise before teaching with E-learning* (see Table 8-10 on page 192).

Table 8-9 Academic integrated finding 1: E-learning infrastructure & leadership in E-learning varied in schools of Nursing and Midwifery across Australia

Academic Phase 1 Sub-theme n=25 (%)	Narrative examples	Phase 2 Finding n=203	Phase 2 open responses category n=297 (%)	Integrated finding
Lack of teaching resources (68) University technology is out of date (32)	Academic 25: *... the infrastructure and the technology, like going into a lecture theatre for thirty people and there's not even a data projector and you have to bring your own laptop is just ridiculous* (FGA5). Academic *20 ….we sent an email to the university IT staff and they said that at the moment we couldn't download the software we use on campus in our home computers so we couldn't mark through the PDF even if we can transform the document from the Word document to PDF* (FGA4). Academic 8: *I know that they say they're addressing it* [updating ICT] *but I've been here for three and a half, four years now and it hasn't changed* (FGA2). Academic ***6: It's such a dampener because there you are, you've got to this effort and there just isn't the facilities there to accommodate this effort that you've made*** **(FGA2).** Academic 2: *We're also dealing with a lot of old stuff*… (FGA1). Academic 14: *But I think that's the point, it's the consistency of resources, I mean we've all got whiteboards, we've all got overheads, those projectors, but the consistency of the technology is really limiting in the way you shape your approach to it* (FGA3). Academic 8:*….so maybe that's one of the other issues that we've got is that while we need to be keeping up with this* [E-learning technology] *sometimes it's not as well supported and I don't mean that from the people involved I mean from an infrastructure place, capacity* (FGA2)	Factor 2 Problems with E-learning Median 15 (IQR 12-18) Maximum score 28	Lack of infrastructure & leadership in E-learning (32.3) Barriers to E-learning innovation (8.4) *ICT incompatibilities* *Lack of ICT in classrooms* *Lack of recognition of excellence in E-learning* *Lack of online resources* *Lack of consistency across staff using E-learning*	1. E-learning infrastructure & leadership in E-learning varied in schools of Nursing and Midwifery across Australia

Table 8-10 Academic integrated finding 2: Academics lacked time to develop and incorporate E-learning into their teaching

Academic Phase 1 Sub-theme n=25 (%)	Narrative examples	Phase 2 Finding n=203	Phase 2 open response category n=297 (%)	Integrated finding
Lack of Time (48)	Academic 6: *I would like to* [use more E-learning] *but the technology is not available and the resource factor, the people* [educational technologist] *resource factor and the time that you need to develop these things* (FGE3). Academic 16: *The LMS Live has potential but it's time consuming... it's got potential there but I think we still need the support and acknowledging that it takes time to be able to put materials together to fully utilise it for people* (FGE3). Academic 5:…*find ways of being innovative, to my mind it's got to come in one of two ways, it's either going to free the up the coordinators to go and do that or pay somebody as you were suggesting before, either individuals who are very good at it or actually have them in the flexible delivery unit to be available for that activity. If you're trying to do it on top of everything else you've got very limited opportunity* (FGA1).	Factor 2 Problems with E-learning. Median 15 (IQR 12-18) Item: There is not enough time to develop E-learning resources. Maximum score 7 mean 3 (SD 1.67) Item: There is not enough time to incorporate computer and web-based education into the subjects I teach. Maximum score 7 Mean 4.1 (SD 1.8).	E-learning requires more time 84 (28.3) Lack of time 21 More time to learn E-learning 28 More time to develop ICT resources 18 More time to ensure quality of resources 10 More Time to practice before teaching with ICT 7 E-learning increases my Workload 25 (8.4)	2. Academics lacked time to develop and incorporate E-learning into their teaching

8.4.2.3 Academics wanted ICT professional development

Nine (36%) of the 25 academics who participated in the Phase 1 focus groups discussed how they wanted tailored, timely professional development to allow them to move forward with integrating E-learning into their teaching. In the Phase 2 questionnaire, academics were asked to rate on a Likert scale how helpful they found a variety of ways to receive professional development. Over 50% (n=203) of the respondents found it helpful to receive professional development in any of the following formats: written; face-to-face; by video; or by self-paced CD or DVD. Further, in the open responses, academics indicated that they wanted more ICT professional development (20%, n=59) to assist in learning how to use the E-learning technologies and incorporate these new pedagogies into their teaching (see Table 8-11 next page).

8.4.2.4 Academics experienced frustration using ICT and its associated technology

This fourth integrated finding was supported by 24% of the academics from the focus groups who discussed how frustrated they became when trying to use E-learning and its associated ICT when they were working. This level of frustration was further supported by F2 “Problems with E-learning” which explained 7.4% of the variance from the Phase 2 data (see Table 8-12 on page 195).

8.4.2.5 Academic respondents were confident using E-learning and felt it added value

This was the most positive of the integrated academic findings. Academics from the Phase 1 focus groups contributed 17 (68%) positive comments about how E-learning added value to their teaching and provides opportunities to accommodate more learning styles. They also commented upon the increased flexibility E-learning afforded to both students and academics.

Phase 2 analysis supported these narratives. The exploratory principal component analysis undertaken on the questionnaire data revealed that two of the three factors extracted supported the theme. F1 “E-learning adds value” explained 33.1% of the variance, while F3 “Confident using E-learning” explained 7.4% of the variance. Another set of items in the questionnaire elicited academic respondents’ use of ICT equipment. The maximum score was 20, with a mean score for ICT use of 16.1 (SD 2.9), indicating that the academics were strong users of ICT technologies (see Table 8-13 on page 196).

Table 8-11 Academic integrated findings 3: Academics wanted professional development related to ICT and E-learning technologies and pedagogies

Academic Phase 1 Theme n=25 (%)	Narrative examples	Phase 2 Finding n=203 (%)	Phase 2 open response category n=297 (%)	Integrated finding
Professional development (40)	Academic 10: *I think yes we do need assistance with that because that's not our expertise and as we get further expertise it would be good but I think that will always be the case and I think we do need people who that's their job is to assist us with that* (FGE2). Academic ***19: And one of the hardest parts for academics is a) knowing what's out there, getting trained up and doing it, getting trained up and then not using it for twelve months because it's not in a topic, and then by the time, oh my topic, we're going to use this, I need more training (FGE4).*** Academic 10:…*LMS Live* [synchronistic online tutorial] *and if things stuff up or if we don't have the answers or if we can't provide the right information then it is a little bit tricky, we have methods to get around that but still it's a challenge and if you're not used to the technology it's a high challenge (FGA2).* Academic 15: *But it's also appropriate professional development, I mean the program doesn't offer us anything specifically for helping us with what we need (FGA3).*	Staff Development Written web-based resources helpful 118 (58.1) Staff Development Face-to-face sessions helpful 111 (54.7) Staff Development Streaming Video (internet based training) helpful 109 (53.7) Staff Development Group Sessions (brainstorming) helpful 108 (53.2) Staff Development by CD or DVD (self-paced training) helpful 107 (52.7) Staff Development One-time events (faculty forums by experts in the field) helpful 106 (52.2)	3. Academics wanted professional development 59 (20)	3. Academics wanted professional development related to ICT and E-learning technologies and pedagogies

Table 8-12 Academic integrated findings 4: Academics experienced frustration using ICT and associated technology

Academic Phase 1 Sub-theme n=25	Narrative examples	Phase 2 Finding n=203	Integrated finding
Academics experienced frustration using E-learning and the associated technology (28%)	*Academic 23: But I think it's frustrating that I still have to download that snippet onto my USB, plug it in, put it onto the desktop for it all to run correctly, then again it excites me that I can do that but then it's also the limitations of my own knowledge but also the limitations of the technology they have here as well (FGA5).*	Factor 2: Problems with E-learning. Median 15 (IQR 12-18) (Maximum score 28).	4. Academics experienced frustration with ICT and associated technology
	Academic 19:…the fact that it [electronic gradebook] keeps going back to the beginning is frustrating so I just keep to the twenty per page and remember to do the right one and not do the same page again, but it is frustrating that it then gets stuffed up and you kind of go, 'can you send me your results', 'I've entered them', why can't I just send you the spreadsheet and then merge them all and put them all in, so yeah I can understand how it's frustrating when you've got several people doing that (FGA4).		
	Academic 16: *And every time you enter something it [electronic gradebook] actually goes back to the front page, so you're in Z and you're back at the front page and that's fine except when you've got four hundred of them and do this a million times a day its frustrating (FGA3).*		

Table 8-13 Academic Integrated finding 5. Academics were confident using E-learning and felt it added value

Academic Phase 1 Sub-theme n=25	**Narrative examples**	**Phase 2 Finding n=203**	**Integrated finding**
Positive about E-learning and the associated technology (68%)	*Academic 23: I've put every lesson onto PowerPoint and so I've got all my links and everything, it's been a really nice way of organising and changing things around. I still have my handouts and stuff but I've put as much as I can onto e-reserve, I've put articles onto LMS, all the forms for their stipends and their scholarships. I've got all my links and everything; it's* [using LMS] *been a really nice way of organising and changing things around (FGE5).* *Academic 24: It's* [LMS live] *really good too because if you want to show how something is done because you can actually drop it back and pull up a webpage you can kind of say right I'm going to change the screen now, this is where we start, and they can see step by step how easy it is. …In a way it's a matter of also defining the appropriate place and one of the things which I love is when actually students bring computers in* [to the face-to-face class room] *that are wireless, and wireless connection is fantastic, I so love that,… (FGE5).*	Factor 1: E-learning adds value. Median 44 (IQR 40-50) (Max. score 63) Explained 33.1% of the variance. Factor 3: Confident using E-learning Median 12 (IQR 10-13) (Max. score 21). Explained 7.4% of the variance.	5. Academics were confident using E-learning and felt it added value

8.5 Summary

This chapter has presented the integration of the student and academic data from Phase 1 and Phase 2 of the study. The four confirmed integrated student findings and five confirmed integrated academic findings illustrate the value of an integrated study design in mixed methods research. In the next chapter, the integrated findings are discussed in light of the current research literature.

Chapter 9 Discussion of Integrated Findings

9.1 Introduction

This chapter discusses the integrated findings from the student and academic data displayed in Chapter 8, and how these findings relate to the study's aims and objectives. The integrated student findings are discussed first, followed by the integrated academic findings. The study's aims and objectives as stated in Chapter 1 are restated here for clarity. Current research literature is used to either support or provide an alternative view to the study's integrated findings. The student discussion commences with the presentation of the four integrated findings. The second part of the chapter discusses the five academic integrated findings. The study's limitations are covered in the final section of the chapter.

9.2 The study's aims and objectives

As stated in Chapter 1, the aim of the research was to explore and identify students' and academics' experiences of, and perspectives about, current issues relating to E-learning and its associated ICTs, and their use in nursing education in Australian university undergraduate nursing programs. The specific objectives addressed were:

1. To determine the issues involving E-learning and its associated technology for undergraduate nursing students in Australia.
2. To determine the issues involving E-learning and its associated technology for nurse academics teaching in undergraduate programs in Australia.

9.3 Integrated student findings

The four integrated student findings to be discussed are presented in Table 9-1, followed by discussion of each in order.

Table 9-1 Integrated student findings

Integrated student E-learning findings	
1.	Few students were positive about E-learning
2.	Students had difficulty with database searching and wanted to learn database searching skills
3.	Students experienced frustration and anxiety using computers
4.	Students had low computer literacy skills but wanted to learn ICT skills

9.3.1 Discussion of integrated finding 1: Few students were positive about E-learning

The results from Phase 1 (focus groups) and Phase 2 (questionnaire) of this study indicate that the majority of students were negative about E-learning. As identified previously (Chapter 5 section 5.5), the researcher found three themes in the Phase 1 data: “Frustration”, “Fear when using computers” and “Low levels of computer information literacy (CIL) skills”. The results from Phase 2 further supported these Phase 1 themes, with factors one and three being: “Database searching difficult” and “Difficult and causes anxiety”.

It is also noteworthy that students in both Phase 1 and Phase 2 discussed positive aspects of E-learning such as flexibility, connectedness and access to online resources. The results of Phase 2 indicate that 92.9% (n=433) used the computers to connect with other students and 94.2% (n=439) academics (see Table 7.17), while students from Phase 1 (see Table 8-1 and Chapter 5, section 5.4) discussed how they preferred to communicate with other students outside of the LMS using Facebook™.

These findings are similar to those discussed by Safford (2014) and Lohnes Watulak (2012), who both found that some students did not like or want to use computers. Reid (2014) found that students’ low CIL skills caused frustration for both students and academics. Gustafson (2004) also reported the experience of frustration for students using ICT. In contrast, Wang and Chui (2011) found that students used E-learning in a more positive way to communicate with others and receive feedback from academics.

It may be questioned that perhaps the students’ learning is not always the focus when universities increase the amount of E-learning they offer. The 2016 Horizon report states that the increase in the amount of E-learning is “addressing the difficulties associated with maintaining and growing physical campuses” (Adams Becker, Cummins *et al.* 2017 p.3). Chen *et al*. (2015) also suggest that the main reason for moving large undergraduate courses to an online format is to address large enrolment numbers in high demand courses rather than for educational reasons. This reasoning is also supported by Eynon (2008), who states that in order for universities to remain competitive in the marketplace, they must implement E-learning to keep their enrolment numbers expanding.

Therefore, it is contested that while E-learning and its associated technology provides increased flexibility for some students, not all students in schools of Nursing and Midwifery across Australia want to use them. The issues raised by students regarding their concerns related to their perceived lack of CIL skills, frustration and anxiety around computer use are discussed in the subsequent integrated findings.

9.3.2 Discussion of integrated finding 2: Students had difficulty with database searching and wanted to learn database searching skills

This finding was supported by the literature relating to CIL. Students in Phase 1 found the databases inaccessible, confusing and hard to understand (see Table 8-1 and Chapter 5, section 5.5.3.2). Students from Phase 2 stated similar difficulty, with the factor two item “*I have* *difficulty finding my way around the library databases"* loading at 0.856 (see Table 6-3)

Database searching is a key element in sourcing, accessing, critiquing and managing digital information (Bond & Procter 2009, Nayda & Rankin 2009, Littlejohn, Margaryan *et al.* 2010, Robertson & Felicilda-Reynaldo 2015). Students from both phases of the study indicated they did not know how to search the library databases. Back in 2009, Nayda and Rankin (2009) came to the same conclusion – that nursing students could not effectively use the library databases and did not access the library staff for assistance (Nayda & Rankin 2009).

This finding is further supported by a four year study by Littlejohn, Margaryan and Vojt (2010), which found that while students were competent at using social networks such as Facebook®, there was no correlation between those abilities and the technologies used in formal learning at university. Earlier research by Bond (2009) found that nursing students overestimated their abilities when entering university and were unable to successfully search library databases. This is still an issue in 2015, as highlighted by Robertson and Felicilda-Reynaldo (2015), who found that graduate nurses overestimated their skills related to database searching and were still unable to effectively search databases in the workplace.

It should be acknowledged, however, that nursing students are not unique in having difficulty searching databases as part of their undergraduate studies. Badke (2010) sees CIL as:

> ... a complex and challenging set of understandings and skills that require much instruction and practice to develop to the point of sophistication, the response of academia to this point has been to make it a remedial issue. (Badke 2010 p.130)

Badke (2010) has put forward seven reasons why CIL remains "invisible" in higher education. The researcher has used these reasons to guide the following discussion. First, CIL is about understanding information and how it works. Currently in academia, CIL is treated as a skill that entry-level students adequately achieve from a capable librarian during orientation week. The belief is that once these skills have been explained to the students, they somehow have attained the required CIL skills to equip them for their future studies. Information literacy is also contextual, with different CIL skills required in particular environments, such as nurses working in the health care context (Badke 2010, Lloyd 2011). Nursing students need CIL skills to be taught within a contextual framework similar to what they will be using in their workplace following graduation (Bembridge, Levett-Jones *et al.* 2011, Lloyd 2011).

Second, academic administrators do not have CIL on their agendas as an issue that needs addressing. Academics appear to think that the current librarian resources are adequate for students to learn and develop their CIL skills. Badke (2010) also acknowledged that the literature related to CIL remains in the library silo, isolated from the academics who teach in the programs.

Third is Badke’s (2010) notion of the “perpetuated experience of osmosis”. Here, academics appear to think that students learn CIL skills by undertaking research instead of being equipped with CIL skills before they undertake research. In the nursing literature, this osmosis concept has also been put forward as a way in which nursing students are supposed to acquire CIL skills (Bond & Procter 2009, Jeffrey, Hegarty *et al.* 2011, Shariman, Razak *et al.* 2012).

Fourth is that faculty culture makes CIL less significant than other educational discipline content pursuits. For example, academics plan their topics to deliver discipline-specific content, not what is perceived as library skills.

Fifth is that faculty appear to agree that a student’s ability to complete basic skills on a computer equates with the achievement of adequate CIL. This faulty concept has been highlighted by other research literature (Coombes 2009, Head & Eisenberg 2010, Li & Ranieri 2010, Calvani, Fini *et al.* 2012, Parkes, Stein *et al.* 2015). In addition, Coombes (2009), Head and Eisenberg (2010), Li and Ranieri (2010), Calvani, Fini *et al.* (2012) and Parkes, Stein *et al* (2015) contend that even though students may have been born into the digital age (“digital natives”) and have communication-mediated communication skills, they are not equipped with the CIL skills required for undertaking higher education study.

Sixth is the lack of collaboration between faculty and higher education librarian staff to improve students’ CIL skills. There is a perceived division between what occurs inside/online in the classroom, and current knowledge and resources available from librarians (Lloyd 2011). Robertson and Felicilda-Reynaldo (2015) support the need for learning activities to be deliberately staged throughout the students’ degree to provide additional opportunities for CIL assessment. They acknowledge that further research into nursing students’ CIL self-efficacy and performance is required.

The seventh factor impacting on the invisibility of CIL in higher education is that only one of the six accrediting bodies in the United States has placed significant emphasis on CIL. A review of the Australian higher education standards framework, the Australian Tertiary Education Quality Standards Agency (TEQSA) (Tertiary Education Quality Standards Agency 2015) and the Australian Qualification Framework (Australian Qualification Framework (AQF) 2015) webpages did not find the terms “computer information literacy”, “digital literacy skills”, “information communication technology (ICT) skills” or “computer skills” featured in any documents or publications.

It is apparent from this discussion that the issue of low CIL skills for nursing students in Australian undergraduate programs is symptomatic of a more widespread situation in higher education. The researcher posits that students from the study were not being provided with the opportunities to learn and refine their CIL skills beyond orientation. The assumption that commencing students will somehow achieve the required CIL skills through either a face-to-face or online optional library database searching tutorial should be contested. The researcher believes that the development of CIL skills should be core business and essential to the curriculum. This discussion is elaborated further in the discussion of academic integrated findings. In addition, the Australian Tertiary Education Quality Standards Agency (TEQSA) (Tertiary Education Quality Standards Agency 2015) standards framework for higher education is neglecting to focus on CIL skills as a required foundation for commencing students.

The next section discusses the third integrated finding, *Students experienced frustration and anxiety using computers.*

9.3.3 Discussion of integrated finding 3: Students experienced frustration and anxiety using computers

The results of Phase 1 and Phase 2 of the study indicated that students were frustrated and anxious when it came to using ICT and E-learning. Further analysis of these results showed that both external and internal barriers contributed to their anxiety and frustration. These are discussed in the subsequent sub-sections.

9.3.3.1 External barriers impacting students' use of E-learning and its associated technology

Students from Phase 1 discussed external barriers such as the ability to access a stable internet connection when away from the university campus and the variability of internet speed outside of the university (see Table 8-1 and Chapter 5, section 5.5.1). These external factors meant that students with slower internet services would have to wait longer for E-learning resources to open and download, which added to their level of frustration. Other external factors identified by Phase 1 students included incompatibilities with devices and software versions (see Chapter 5, section 5.5.1); a finding supported by open response categories 12 and 15 from Phase 2 (see Table 8-3). Students from the Phase 1 focus groups discussed the inaccessibility of the university online enrolment system (see Table 8-1 and Chapter 5, section 5.5.3.1); another finding also supported by students' results from Phase 2, factor two item "I have difficulty finding my way around the university websites", loading at 0.772 (see Chapter 6, Table 6-4).

A report by the Australian Bureau of Statistics into Household Internet Access (2014-2015) indicates that 14% of households are without an internet connection. Ability to connect to the internet in Australia is also dependent on where you live, for example, only 81.7% of households in Tasmania can connect to the internet while in Canberra, the nation's capital, 94.1% of houses have access to the internet (Ewing 2016). The ongoing concern in Australia, as highlighted by Ewing (2016), is that as more and more resources move to the online digital environment, the disadvantage for those Australians not connected to the internet will increase. Even when the National Broadband Network (NBN) roll out is completed across Australia, the relative disadvantage of households on slower internet connections will increase (Ewing 2016).

The current study found that even where students were able to achieve an internet connection, they were frustrated with the slow internet download speed of E-learning resources. A report by Akamai (2015) indicated that Australia's download speeds were ranked at 49th (40 Mb/s) in the world. It was predicted that by 2025, the Australian download speed will still only reach 75% of the world average of 600 Mb/s (Tucker 2016). Research predictions undertaken by Tucker (2016) are not favourable regarding the NBN's usefulness to Australians. Tucker claims that the fibre-to-node technology being installed across Australia "will cement Australia's place as an internet backwater", with Australia's download speed predicted to plummet as low as 100th in the world by 2020 (Tucker 2016 *p.* 1).

Despite the technological problems identified above and the expressed dissatisfaction of university students with regard to these issues, no acknowledgement of these concerns is evident in the 2016 NMC *Technology Outlook for Australian Tertiary Education: A Horizon Project Regional Report* (Adams Becker, Cummins *et al.* 2016). Instead, the report relates how E-learning is already "common place and has proved to enhance the face–to-face offerings as well" (Adams Becker, Cummins *et al.* 2016 *p.* 12).

9.3.3.2 Internal barriers impacting on students' use of E-learning and its associated technology

The current study also identified internal factors (inherent to the student) that hindered students' ability to use E-learning and its associated technology. These factors included self-reported anxiety when using ICT and concern regarding their own level of ICT skills.

9.3.3.2.1 Self-reported anxiety when using ICT

Students reported high levels of anxiety when using ICT in both phases of the study (Phase 2 Factor 3 *"ICT difficult and causes anxiety"* see Table 8-3; Phase 1, see Chapter 5, section 5.5.2). This anxiety has been found to negatively impact on willingness to use ICT and its perceived usefulness for student learning (Korobili, Togia *et al.* 2010, Akhu-Zaheya, Khater *et al.* 2013, Celik & Yesilyurt 2013, Saadé, Kira *et al.* 2013, Maricutoiu 2014).

Saade (2013) argues that anxiety related to using ICT is a specific concept. This type of anxiety is related to feelings associated with a student using a computer to interact with a LMS. This type of anxiety can be more intense for students because of the need to obtain a grade and the possibility of failure (Tsai 2009, Saadé, Kira *et al.* 2013). A literature review by Powell (2013) found that this anxiety was not related to age or gender; a finding concomitant with the findings of this current study.

While over 10,000 articles published between 2015 and 2017 indicated that student ICT anxiety levels remain an issue for educators (Proquest 2017), student ICT anxiety was not acknowledged by the 2017 NMC Horizon report on higher education (Adams Becker, Cummins *et al.* 2017). The researcher argues that nursing students' self-reported high levels of ICT anxiety impacts on their level of motivation to use E-learning. In addition, a student's level of anxiety will remain high if E-learning technology is tied to student assessment. This finding has implications for the planning of assessable components in undergraduate nursing topics.

9.3.3.2.2 Self-reported difficulty and frustration when using ICT

Students from both phases of the study experienced frustration when ICT devices did not function as predicted Phase 1 results are given in Table 8-1 and Chapter 5, section 5.5.2 and Phase 2 Factor 3 *"ICT difficult and causes anxiety"* see Table 8-3. These findings are supported by Lohnes Watulak (2012), who found that some undergraduate students do not like or want to use ICT in their everyday life. This meant that for these students, commencing their studies had an added layer of complexity. In addition to learning content, students also had to navigate their way through learning ICT skills.

The overestimation of ICT skills by commencing nursing students was highlighted as a concern back in 2004 (Bond 2004). Bond repeated the study in 2009 with similar results (Bond 2009). Bond concluded that undergraduate nursing programs in the United Kingdom needed to provide contextual nursing CIL competencies in order to support student practice (Bond & Procter 2009). These findings were further supported by Jeffrey *et al*. (2011), who found that if students were overconfident regarding their ICT technical proficiency, this could hinder their ability to develop their CIL skills.

Ghandoura (2012) found that a student's intention to use computers was predicated on positive past experiences with using ICT. Computer self-efficacy, the "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura 1986 p.3), had a significant impact on student satisfaction with online environments, including their intention to take future online study (Alqurashi 2016). If students possessed advanced skills in mobile technology and ICT, these both played significant roles in students' intention to adopt mobile E-learning (MacCallum and Jeffrey (2013).

The lack of acknowledgement of student difficulties and frustrations is again seen in the 2017 NMC Horizon report, which states "online, mobile and blended learning are foregone conclusions". It goes on to say that universities will not survive if they have not already adopted these technologies (Adams Becker, Cummins *et al.* 2017 p. 4). There seems to be little regard for the end user in these statements.

Based on this current study and published results from other studies, students' previous experience with ICT will impact on their motivation and ability to engage with E-learning. In addition, Australian nursing students' frustration with using E-learning was compounded by issues such as no or slow internet access. It appears from this discussion that the needs of the E-learning end user – the student – seem to be lost.

The discussion now moves to the final student integrated finding, *Students had low computer literacy skills but wanted to learn ICT skills.* This discussion then moves to an overview of the Technology Adoption Model (TAM) first developed by Davis (1986). The researcher has used this model to explain the use of E-learning and its associated technology by nursing students in this study.

9.3.4 Discussion of integrated finding 4: Students had low computer literacy skills but wanted to learn ICT skills

Some students reported they were offered introductory ICT courses when they commenced their studies (Phase 1 see Chapter 5, section 5.5.3 and Phase 2 6% (n=45) student comments see Table 8-3). Results from this study indicate that these courses were not sufficient. Students from both phases realised they did not have the ICT or CIL skills required to engage fully with E-learning, with Phase 1 students stating they would find their studies easier if they knew more about computers (see Chapter 5, section 5.5.3 for Phase 1 students' comments). Further, based on responses to the open ended questions in Phase 2, students indicated they had difficulties using ICT and wanted to acquire more ICT skills (see Table 8-1 and Table 8-3 categories 3, 7 and 9).

The current study's findings are supported by longitudinal research undertaken by EDUCAUSE (Brooks 2016), which reports that students who are not prepared with skills to use basic ICT and software become distracted from specific areas of their studies. Brooks (2016) reported that students were not able to use institutional technologies such as LMS.

These results are further supported by Levett-Jones *et al.* (2009), who found that nursing students from across three Australian universities were resistant and lacked confidence in using computer information technology. Levett-Jones *et al.* (2009) also found that nursing students did not appreciate that when working as a registered nurse they would be constantly interacting with ICT equipment. They concluded that student motivation to use ICT was influenced by students' levels of confidence and appreciation of the relevance of ICT to their future careers.

Lee and Clarke (2015) identified *four* factors related to ICT use by nursing students whilst undertaking their placement in health care agencies. The first factor they found was that these students valued the use of ICT to improve their client care, access information and undertake rapid communication with allied health professionals. The second factor was that the students still wanted additional, ongoing, relevant ICT knowledge and skills because they realised that they would need to increase their ICT skills to be successful in their nursing career. The third factor revealed that students had varied levels of confidence with ICT, with some still feeling intimidated at the thought of using it. The fourth factor revealed that nursing students felt the increased use of ICT in health care was time consuming, more trouble that it was worth and made staff less productive (Lee & Clarke 2015).

On the basis of the study results and the above discussion, the researcher argues that even though some nursing students may be provided with introductory ICT courses when they commence their degree studies, these courses are clearly insufficient to equip students with the knowledge and skills they will require for their study and future careers. It would appear that while focusing on providing important nursing content to students, schools of Nursing and Midwifery overlook the importance of ensuring students have the CIL skills they need to undertake their studies.

The four integrated findings from this study are consistent with the Technology Adoption Model (TAM), which is the most commonly used predictor of ICT use. Therefore, in the next section the researcher uses TAM to explain how nursing students from this study interacted with E-learning and its associated technology.

9.4 The Technology Adoption Model in relation to nursing students' use of ICT

The TAM is the most significant, most commonly used predictor of ICT adoption (Davis 1993, Venkatesh, Morris *et al.* 2003, Venkatesh & Bala 2008, Park 2009, Teo 2014, Fathema, Shannon *et al.* 2015). The model was originally based on Ajzen and Fishbein's Theory of Reasoned Action (TRA) (1980). In the TRA model, an individual's intention to undertake certain behaviour is a combination of their attitude towards the act of behaviour and social norms. A person's intended behaviour is shaped by their attitude. In 1986, Davis further modified the original model so it consisted of five determinants (see Figure 9-1) (1986).

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Davis, F. D. (1993). "User acceptance of information technology: system characteristics, user perceptions and behavioral impacts." International Journal of Man-Machine Studies 38(3): 475-487. P. 481.
http://dx.doi.org/10.1006/imms.1993.1022

http://www.sciencedirect.com/science/article/pii/S0020737383710229 accessed 28 /11/17

Figure 9-1 Technology Acceptance Model (TAM) originally developed by Davis (1986)

When considering the application of TAM to the nursing students in the current study, students were located in all five areas of the model. This model indicates that perceptions and attitudes towards ICT will impact on its actual use. For example, students who reported difficulty and frustration using university websites did not perceive ICT and E-learning as either easy to use or useful. This perception indicated their *Perceived Ease of Use (PEOU)* and their *Perceived Usefulness (PU)* were low. They also had a negative attitude towards using E-learning and its associated technology, as highlighted by the results that showed students did not like E-learning and wanted more face-to-face teaching (see Chapter 7, section 7.7.1). Therefore, they had a negative *Attitude to Using (ATU)* E-learning and its associated technology. Together, these factors impacted on the *Actual Use (AU)* of E-learning. Therefore, based on the TAM model, it is not unexpected that many nursing students do not want to adopt/use E-learning and its associated technology.

One of the barriers to positive student attitudes towards E-learning may lie with the assumption that the current cohort of students live in the digital era and therefore are deemed as “digital natives”. Hence, the next section discusses what is meant by the term “digital native” and how this term may be a misnomer. Results from this research provide strong evidence that many commencing students were not the “tech savvy experts” some literature implies.

9.5 The myth of the “digital native” student

The results from the current study refute the opinion that undergraduate students enter their higher degree studies equipped with the skills and knowledge required for university study. Prensky (2001), McCrindle (2006), and Palfrey and Gasser (2008) suggested that the generation of students born after 1980 and who had grown up with access to computers and the internet would somehow be inherently technology-savvy. These students became known as “digital natives” (Prensky (2001).

Studies conducted since 2010 have found that instead of comprising a homogenous group of learners, that first year undergraduate students are a “mix of minority groups” with significant age-related differences in their everyday lives (Jones, Ramanau *et al*. (2010 p.722). Significantly, other studies have found similar results that support the current thesis (Smith, Skrbis *et al.* 2013, Somyürek & Coşkun 2013, Thompson 2013, Lai & Hong 2015, Parkes, Stein *et al.* 2015).

An Australian study by Smith, Skrbis *et al.* (2013) found that high school students required additional instruction to effectively use the internet and software programs for homework despite being able to use social networks for communication. This finding dispels the idea of generational digital skills accompanying the “digital native”. Thompson (2013) and Tossell, Kortum *et al.* (2014) also found that the so called “digital native” used superficial sources for information, such as text messaging and social media networks like Facebook™. Both studies implied that the frequent use of this rapid communication technology could in fact lead to less productive learning behaviours and even provide an option for procrastination. Keeping this use of technology in mind, higher education teachers need to provide scaffolding to improve student study skills and learning habits (Thompson 2013, Tossell, Kortum *et al.* 2014).

While commencing higher education students may have some of the CIL skills required to study at a tertiary level, an Australian and New Zealand study by Parkes *et al.* (2015) found that students and staff had different perceptions of what constituted “being prepared to commence studies”. Academic staff considered students using computers to be able to read and write at a commencing tertiary level; identify and critique the requirements to complete a set task; provide clear, unambiguous responses; and synthesise ideas (Parkes, Stein *et al.* 2015). Students, on the other hand, viewed being prepared to study at a university as requiring the following skills: able to use computer technology; search the internet using search engines; and download and upload resources (Parkes, Stein *et al.* 2015). The Parkes *et al.* (2015) study highlighted the difference in perception about what is required by students and staff, and suggested that students require ongoing support programs beyond discipline-specific content. Student narratives from Phase 1 highlight that they were not prepared with the CIL skills they required (see Chapter 5, section 5.5). Schools of Nursing and Midwifery are not alone in not providing students with learning opportunities to improve their ICT and CIL skills. The 2016 report on digital literacy (Alexander, Adams Becker *et al.* 2016) undertaken by the New Media Consortium (NMC) found that (36%, n=450) of North American tertiary education respondents had no CIL initiative in place for students or staff.

The researcher argues that students in the current study were aware of their deficits related to ICT and CIL skills, and wanted more structured opportunities to learn both. She postulates that schools of Nursing and Midwifery in Australia are incorrectly assuming that commencing students are equipped with, and competent to use, the CIL skills required for their higher education studies. As a result of this incorrect assumption, students are not provided with the structured learning opportunities to develop CIL skills to assist them to make the most of E-learning and its associated technology.

Even if undergraduate nursing students achieve a level of CIL skills required to complete their degree, will these graduates be equipped with the type of CIL skills required when they enter the health care workforce? The next section discusses the Australian Nursing and Midwifery Council (ANMAC) accreditation guidelines for education programs leading to registration as a nurse or midwife.

9.6 Mismatch between the Australian Nursing and Midwifery Council (ANMAC) CIL requirements for nurses and midwives, and practice CIL requirements

All undergraduate programs of study leading to registration as a nurse or midwife in Australia are required to meet education provider standards and accreditation by the Australian Nursing and Midwifery Accreditation Council (ANMAC) (2012). When reviewing the accreditation standards for registered nurses, the concept of CIL (or a similar description, e.g. ICT, digital, computer, electronic) does not appear. However, the concept of “Health Informatics” and “Health Technology” is covered in one sentence in Standard 4, “Program content supports the development and application of knowledge and skills in: e). health informatics and health technology” (Australian Nursing and Midwifery Accreditation Council (ANMAC) 2012). The concept of Health Informatics for the registered midwife is covered under the same section as for a registered nurse, Standard 4.4, “Program content includes but is not limited to supporting the development and application of knowledge and skills in: h) health informatics and health technology” (Australian Nursing and Midwifery Accreditation Council (ANMAC) 2014). No definition of what the terms “Health Informatics” or “Health Technologies” constitute is provided in either document.

In addition to the course accreditation standards, registered nurses and midwives each have unique standards of practice by which they are assessed to be eligible for registration (Nursing and Midwifery Board of Australia 2016) (see Appendix 9a). However, there is no mention of CIL skills, skills in Health Informatics or ICT, or digital or electronic resource use within these documents (Nursing and Midwifery Board of Australia 2016) despite the importance of these skills in patient-centred care. Hence, there is a disconnect between the standards and actual practice. Badke (2010) cites this disconnect as another reason for computer information literacy being “invisible”.

The issue of the requirements for safe, effective practice is important to this debate. The next section examines the CIL skills required by registered nurses post-graduation.

9.7 Computer information literacy skills required in the E-health environment

In Australia, nurses and midwives are the largest group in the health workforce, with 290,144 nurses and midwives employed in 2012. The number of full time equivalent nurses and midwives employed for every 100,000 people is almost 3 times that of the next largest profession, medical practitioners. In 2012, there were 1,124 full time equivalent nurses and midwives employed for every 100,000 people (Australian Institute of Health and Welfare 2014).

These statistics confirm that nurses and midwives are the frontline health professionals; the only ones to maintain a 24-hour-a-day, seven days per week contact with patients. Australian nurse academic Barnard (2002) claims that nurses are integral contributors to, and users of, health care technology. He argues that nursing as a discipline has the opportunity to make a profound contribution as to how humans experience technology in health care:

> ….nurses are positioned at an axis point between technology, individuals, clinical environments and communities and have a responsibility to take a primary role in interpreting and influencing the relationship(s) between technology, health care praxis and human experience. (Barnard 2002 p. 20)

It is imperative that nurses and midwives possess the CIL skills required to deliver the highest quality, evidence-based, safe care to the Australian public. Yet the evidence from this study is that nursing students are struggling with their CIL skills. In the current health care system in Australia, graduate nurses and midwives continue to use many of the CIL skills they learnt during their undergraduate studies, including applying them in a professional work context. In the workplace, Lloyd (2011) articulates that information literacy, including CIL, goes beyond a set of skills. The new graduate needs to recognise what constitutes knowledge in each unique setting in which they work (Lloyd 2011 p.278). Lloyd describes information literacy as being:

> …enacted as a situated, collective, and embodied practice that engages people with information and knowledge about domains of action that are authorized by the discourses of the setting. Consequently the information skills and competencies that are developed reflect the discursive practices of the setting. (Lloyd 2011 p.277)

Previous Australian research by Bembridge, Levett-Jones *et al*. (2011) supported the theories put forward by Lloyd (2011) regarding the relevance of ICT skills learnt as a nursing student and the transferability of those skills to the workplace. Bembridge, Levett-Jones *et al.* (2011) found that workplace organisational and contextual factors, in addition to the graduate's own ICT skills, impacted on the transferability of those skills. Workplace satisfaction was further enhanced for new graduates if they were provided with continuing professional development that focused on ICT skills.

Workplaces need to acknowledge that changes in computer-related technologies are occurring rapidly within the health sector. Nursing curricula need to expose students to contemporary technologies to ensure that graduates are able to meet these new challenges. One of these technologies found in the health care sector is the National E-health Strategy, which is discussed in the next section.

9.8 Implications of the National E-health strategy for nursing education

The implications of the current research findings for nursing education are twofold. First, nurse academics should assume that commencing nursing students *do not* have the required ICT and CIL skills. Therefore, structured learning and assessment of ICT and CIL skills needs to be provided. Second, students must be exposed to the same or similar computer health technologies and software programs that they will be expected to use in the workplace.

One strategy for addressing these implications would be to incorporate explicit competencies within the undergraduate program that students need to achieve and demonstrate on graduation. In 2013, the Canadian Association of Schools of Nursing (CASN) developed three informatics competencies for entry level registered nurses (Canadian Association of Schools of Nursing Association Canadienne des écoles de Sciences Infirmières 2013). A list of assessable and observable indicators was also developed to guide the learning required to achieve each competency (Tardif 2006). CASN states that the competencies were intended to provide direction for curriculum development (see Appendix 9b). Similarly in the United States, the Quality and Safety Education for Nurses (QSEN) body has developed Nurse Informatics Knowledge, Skill and Attitude (KSA) competencies that are used to guide education program development (see Appendix 9c).

In 2008, the Australian Government launched the National E-health Strategy, which has a 19-year roll out plan across all Australian health agencies (Australian Health Ministers' Advisory Council 2008). Part of the plan for change and adoption strategies included the implementation of education and training programs to equip *current health care professionals* working in health care agencies with the skills to manage the new digital information system. However, questions must be asked about *the preparation of new health professionals* to enable them to be job ready. There is no mention within the E-health strategy (Australian Health Ministers' Advisory Council 2008)of any supporting resources being provided to universities to enable this vision to be realised.

In one state of Australia (South Australia), the electronic health care management system is known as the Enterprise Patient Administration System (EPAS) (SA Health 2012). This computer communication system is planned to replace all written patient records during a person’s hospital admission. All members the health care team responsible for caring for patients will require access and the CIL skills related to using a networked communication record system to achieve effective use of the system, and to ensure patient safety and confidentiality. However, tertiary-based education programs have no access to any of the (EPAS) software programs or even an educational version being used in the health care agencies. Therefore, nurse academics’ curriculum planning is unable to incorporate any EPAS context-specific student learning.

This gap has been addressed internationally with the development of student specific electronic health records (EHR), known as the “academic electronic health record” (AEHR) (Borycki, Kushniruk *et al.* 2009, Kennedy, Pallikkathayil *et al.* 2009, Wyatt, Xueping *et al.* 2012, Kowitlawakul, Chan *et al.* 2015). These educational health information systems have been purpose built, based on the actual EHR being used by the health care agencies in the area. One successful introduction of this health record system is the University of Victoria (Canada) Interdisciplinary Electronic Health Record Educational (UVicIED-HER) Portal (Borycki, Kushniruk *et al*. (2009).

Students used the UVicIED-HER Portal to access, input and extract simulated patient data from education programs in Nursing and Medicine Health Informatics, with planned extension to physiotherapy and social work. Borycki, Kushniruk *et al*. (2009) found that in addition to providing a realistic system for student use, the portal was also used by health professionals, including administrators and other information technology decision-makers to access and review aspects of EHR. Borycki, Kushniruk *et al.* (2009) concluded that the UVicIED-HER Portal was a promising tool for the education of all health professional students and would hopefully encourage the uptake of EHRs in health care (Borycki, Kushniruk *et al.* 2009).

The researcher concludes that for Australian nursing students, it is imperative that schools of Nursing and Midwifery prioritise the development of an Academic Electronic Health Record (AEHR) as soon as possible. This AEHR will provide the basis for authentic workplace learning and enhance graduates’ ability to provide safe evidence-based care.

In light of the above integrated findings, the researcher developed a model encompassing key results from Phase 1 and Phase 2 of the study, which is discussed in the next section.

9.9 The “nursing student intention to use E-learning” model

The “nursing student intention to use E-learning” model highlights many of the issues related to the use of E-learning and suggests possible strategies to promote its use (see Figure 9-2). In this model, the nursing student lives in a 21st century connected environment and enters the university environment. They bring with them their previous positive and negative experiences of working with ICT and CIL skills.

In the model (Figure 9-2), the red circle and the text above that circle list the issues identified from the current study and the literature that negatively impact on nursing students and their ability to use E-learning and its associated ICT. The blue circle and the text above it include strategies for supporting the use of E-learning suggested by the study respondents and the literature. The green circle and the text above it are the reasons why some nursing students from the study were using E-learning and its associated ICT.

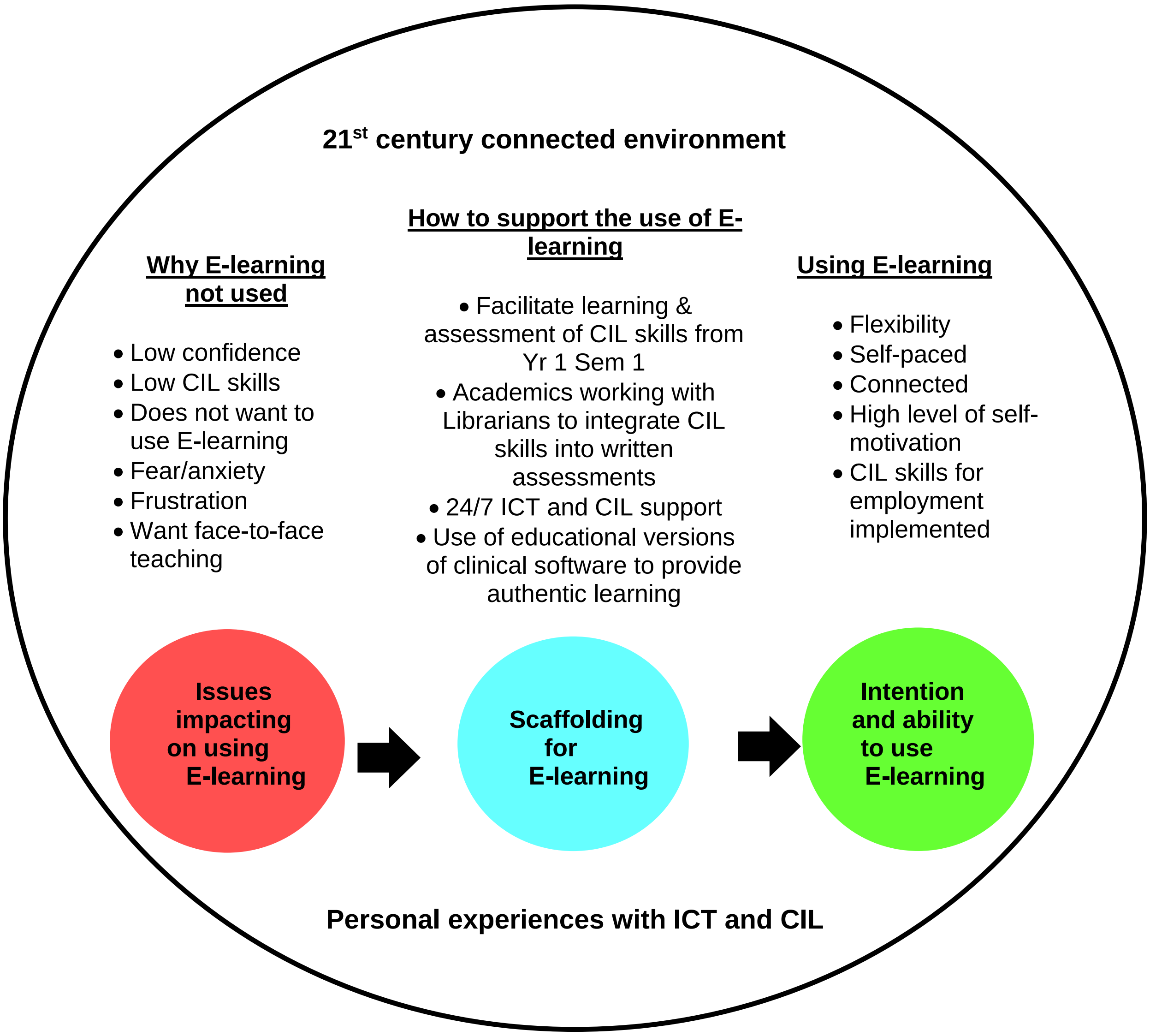

Figure 9-2 The nursing student intention to use E-learning model

9.10 Summary of integrated student findings

It is clear from the discussion of the integrated student findings that education leaders within the discipline of nursing need to act urgently to address the identified persisting issues related to nursing students' low CIL skills. The "invisible" nature of CIL can no longer be ignored by curriculum designers and national course accreditors. The myth of the "digital native" needs to be put aside. The currently accredited undergraduate nursing education programs should be amended as a priority. Nursing students require authentic, structured opportunities to learn CIL skills and have them assessed across the three years of their program. Strategies for schools of Nursing and Midwifery to improve nursing students' CIL skills are discussed in the recommendations in Chapter 10.

The CIL needs of the students just discussed have implications for the nursing curricula and how nurse academics approach these issues. A discussion of the integrated academic findings is presented in the next section.

9.11 Integrated academic findings

The five integrated academic findings developed in Chapter 8 are presented in Table 9-2. The structure of the discussion follows the five integrated findings in order.

Table 9.2 Integrated academic findings

Integrated Academic E-learning findings	
1.	Lack of E-learning infrastructure and leadership in schools of Nursing and Midwifery across Australia.
2.	Academics lacked time to develop and incorporate E-learning into their teaching.
3.	Academics wanted professional development related to ICT and E-learning technologies and pedagogies.
4.	Academics experienced frustration using ICT and associated technology.
5.	Academics were confident using E-learning and felt it added value.

9.11.1 Discussion of integrated finding 1: Lack of E-learning infrastructure and leadership in schools of Nursing and Midwifery across Australia

Academics from the current study sought leadership to provide resource infrastructure and a strategic implementation plan related to E-learning across their schools. Their concerns and frustrations included the lack of consistent and reliable multimedia resources in the teaching spaces (Phase 1, see Table 8-2, Chapter 5, section 5.8.1), and frustration due to hardware and software incompatibilities (Phase 2, Factor 2 *"Problems with E-learning"* and category 9 "ICT incompatibilities" 8.4% (n=25) (see Table 8-4). In both phases, academics were concerned about a lack of time to learn, develop, trial and evaluate E-learning resources prior to using them in class (Phase 1, see Table 8-2, Chapter 5, section 5.8.3; Phase 2, open responses Category 2 *"E-learning requires more time"* 28.3 %, n=84 and Factor 2 item and loadings see Table 6-8).

It is known internationally that the tertiary education sector directs a large proportion of its funding towards instructional technologies, both hardware and software (Selwyn 2016). However, higher education administration claims that academics are not adopting these technologies (Schneckenberg 2010, Dahlstrom & Bichsel 2014, Reid 2014). Schneckenberg (2010) argued that the reasons for these low adoption rates go far deeper than merely lack of faculty interest. He suggested that:

> ...the underlying problems for the E-learning adoption of faculty and the wider educational innovation in universities in general are structural peculiarities of universities and cultural barriers, which are deeply rooted in the academic

community. (Schneckenberg 2010 p. 414)

Reasons given include the value of research output over educational innovation. The current criteria for defining excellent performance of faculty members are comprised of the amount of research money brought into the university and the output of research-based publications. Academics acknowledge that involvement in adopting new instructional technologies that develop educational innovation will impede their career advancement. For the most part, academics' supervisors direct them to become part of a research team producing research-based publications, which, in some cases, are not associated with educational innovation (Schneckenberg 2010, Johnson, Adams Becker *et al.* 2013, Reid 2014).

Table 9-3 presents a list of the 10 most significant challenges in regard to E-learning within tertiary education developed during collaborative research undertaken by the New Media Consortium (NMC) and Open Universities Australia (Johnson, Adams Becker *et al.* 2013). These challenges highlight the complexity of incorporating E-learning strategies into the traditional format of university education.

Table 9-3 The 10 most significant challenges to E-learning in tertiary education

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Johnson, L., Adams Becker, S., Cummins, M., Freeman, A., Ifenthaler, D. & Vardaxis, N. (2013). Technology Outlook for Australian Tertiary Education 2013-2018 An NMC Horizon Project Regional Analysis. The New Media Consortium. Austin, Texas.
P. 19-20
https://www.nmc.org/publication/technology-outlook-australian-tertiary-education-2013-2018/ accessed 28/11/17

Source: Johnson, Adams Becker *et al.* (2013 p. 19-20).

Academics from the current study were impacted directly by items 1, 2, 5 and 7. The implications of these challenges are now discussed.

9.11.1.1 Professional development still does not acknowledge the fact that CIL continues its rise in importance

The first challenge (see Table 9-3) is the need for more professional development. However, Johnson et al (2013) highlight that the need for more professional development alone is not sufficient. The current study found the professional development (PD) offered to academics did not meet their CIL needs; wanted more PD (Phase 1, see Table 8-2, Chapter 5, section 5.9; Phase 2, see category 3, 20% (n=59) Table 8-4). For example, academics from the focus group indicated that current PD was delivered by IT technicians who did not have any educational qualifications. The emphasis was placed on how the software functioned rather than its pedagogical application.

9.11.1.2 Most academics are not using new and compelling technologies for learning and teaching…

The second challenge identified by Johnson *et al.* (2013) was that academics were not using compelling new technologies in their teaching. The current study found that academics were keen to use new E-learning technologies but were inhibited by lack of infrastructure and inadequate PD (Phase 1, see Table 8-2, Chapter 5, section 5.9; Phase 2, see Chapter 7 sections 7.15-16; Chapter 8 Table 8-4 category 3, 20%, n=59). It should be noted that there were also respondents who indicated they did not want to use E-learning technologies in the classroom (Phase 2, see Chapter 7, section 7.14.2).

Osika (2009) found similar experiences; academics' decision to not use technology was strongly influenced by infrastructure ICT support, students' CIL abilities and academics having problems with E-learning technologies. Zellweger Moser (2007) found that the inherent complexity of educational technology is often underestimated, and this accounts for some of the reasons as to why academics have not taken up the widespread innovation. In addition, Selwyn (2013) points out that historically, academics involved in teaching have been "blamed" for not engaging in E-learning technologies. This non-engagement was assumed to be because the individual academic had CIL deficiencies. However, as Petit dit Dariel, Wharrad *et al* (2012) found, some nurse academics chose not to use E-learning technologies because they "valued human interaction" (Petit dit Dariel, Wharrad *et al.* 2012 p.1289). These academics argued that becoming a nurse involved learning from face-to-face classroom experiences interacting with another human being. These learning opportunities were not achievable by using E-learning technologies. Selwyn (2013) agrees and suggested academics may have perfectly rational, pragmatic or even strategic reasons for their non-use of E-learning technologies, considering the wider pressures of their work.

It was not just the problem of vast numbers of programs becoming available; nurse academics were content experts, not instructional media technical experts. Mishra and Koehler (2006) found that due to the wide variety of instructional technologies available, academics struggled to find the appropriate technology tool for the purpose they intended. Reid (2014) suggested that if E-learning technology was unreliable, academics would turn away from it, which would influence others not to even try it (Reid 2014).

9.11.1.3 Our organisations are not set up to promote innovation in teaching

The fifth challenge identified by Johnson *et al.* (2013) (see Table 9-3) that has relevance to the current study is the lack of support for innovation in teaching. Academic respondents reported that this lack of recognition of their attempts to incorporate E-learning into the curriculum was one of the barriers to E-learning innovation; it increased their workload (Phase 2, category 5, 8.4%, n=25, see Chapter 8 Table 8-4). As has been discussed already, many higher education institutions have been shown to value research output over teaching Berman and Skeff (1988). Many authors still agree that incentives and promotions are biased towards research income, including publication outputs (Davidson-Shivers, Salazar *et al.* 2005, O'Meara 2005, Zellweger Moser 2007, Steinert, McLeod *et al.* 2009).

9.11.1.4 Critical campus infrastructures are under-resourced

Johnson *et al.* (2013) recognised the seventh challenge (see Table 9-3) as the critical under-resourcing of E-learning infrastructure across universities. Respondents from both phases of the study agreed that the lack of resources and their age, including both hardware and software, was an obstacle to their ability to advance the use of these technologies in their teaching (Phase 1, see Chapter 5, section 5.8.1). Further, academics were frustrated by incompatibilities between software and hardware (Phase 1, see Chapter 5, section 5.8.4; Phase 2, category 1B 8.4%, (n=25 academic open responses) (see Table 8-4). The findings from this study are also supported by Reid (2014), who identified that academics were dealing with these same barriers as they struggled to adopt E-learning technologies.

Therefore, the researcher argues that schools of Nursing and Midwifery have adopted this new pedagogy without a strategic plan and leadership in E-learning, and without acknowledging its complexities and essential requirements. Consequently, without the required infrastructure and support, academics were frustrated when they could not realise their teaching plans in ill-equipped classrooms. Respondents did not articulate any understanding of their awareness of strategic planning within their organisations for the structured implementation of E-learning. This lack of strategic planning led to an absence of recognition of the time academics required to develop, implement and evaluate E-learning. This challenge is the focus of the second integrated finding.

9.11.2 Discussion of integrated finding 2: Academics lacked time to develop and incorporate E-learning into their teaching

This study found that the lack of time was a major issue of concern for academics, as highlighted by the Phase 2 Factor 2 *"Problems with E-learning"* items "*There is not enough time to develop E-learning resources"* loading of 0.865 and *"No time for E-learning"* with a loading of 0.747"(see Chapter 6 Table 6.5), (see also Phase 1, Chapter 8 Table 8-2 Chapter 5 section 5.8.3; Phase 2, Chapter 8, Table 8-4 category 2 "E-learning requires more time" 28.3% n=84). Respondents indicated that they required time to become familiar with the various types of instructional technologies available (see Phase 1, Chapter 5, section 5.9; Phase 2, Chapter 7, section 7.16). This extra time would enable them to build confidence with these online resources before they integrated them into their teaching.

Academics in other studies have also cited this lack of time as a primary reason for the lack of adoption of ICT (Parthasarathy & Smith 2009, Simpson 2010, Keengwe & Kang 2012, Porter, Graham *et al.* 2016). Reid (2014) argues that instructional technologies require more faculty teaching time at every stage of the implementation process and that it is not simply a task of how to use technology. She points out that institutional leadership may not understand the complexities of the instructional technologies, or the time needed to master them. This argument was also supported by Orr, Williams *et al.* (2009).

When estimating the cost of development of one hour of E-learning and comparing that cost to the cost of developing one hour of face-to-face teaching, Chapman (2010) collated results for 249 companies representing 3,947 learning development professionals. In 2010, he found that to develop one hour of face-to-face instruction took an estimated 43 hours at an estimated cost of $5,943 (US) per hour, and included a lesson plan, handouts, workbook and PowerPoint visuals. It took approximately 79 hours at an estimated cost of $10,054 (US) per hour to develop one hour of E-learning, including content pages, text graphics, perhaps simple audio and/or video, test questions and PowerPoint presentation style (Chapman 2010). It should be noted that this cost was based on computer design technologists developing the resources, not a content expert such as a nurse academic trying to navigate their way through resource development and design. The researcher suggests that many more than 79 hours would be spent by the nurse academic to produce one hour of usable E-learning content. She argues that although nurse academics are confident and willing to use E-learning resources in their teaching, a number of key concerns remain, including acknowledgement of the amount of time required to develop and incorporate E-learning, as well as frustration and institutional barriers experienced nationally by academic participants. These obstacles will need to be removed if E-learning is to be adopted more actively. One of these obstacles is the adequacy of professional development available to nurse academics, as discussed in the next question.

9.11.3 Discussion of integrated finding 3: Academics wanted professional development related to ICT and E-learning technologies and pedagogies

While professional development (PD) was a key component, as discussed in section 9.11.1.1, it was found to be a key concern for academic participants. There was ‘concordance’ (Bazeley 2009) between the findings for Phase 1 and Phase 2, where respondents agreed that they wanted focused PD to build their computer skills and increase the pedagogical quality of existing material. Further, they desired to develop new ideas for future online resources (see Phase 1, Chapter 8 Table 8-2, Chapter 5 section 5.9; Phase 2, Chapter 7, section 7.15). Academics had concerns about the current offerings of PD not meeting their needs (Phase 1, Chapter 5, section 5.9).

As discussed, academic respondents from Phase 1 stated that the PD sessions delivered by ICT technical staff (who were not online educational design technologists) were not effective as because they had little relevance to the educational context required when implementing an E-learning resource. Academics agreed that ICT technicians were concerned with the “nuts and bolts” of how to use a particular resource but not the pedagogical application (see Chapter 5, section 5.9). The researcher emphasises that nurse academics in the study were seeking more pedagogical strategies from their universities’ PD than was currently available, and that the perspectives of colleagues regarding the usefulness of the technology should not be underestimated. The respondents were seeking professional development guided by those with expertise in educational design technology.

Reid (2014) emphasises that the influence of peers or their criticism can have a far reaching and negative impact on the adoption of E-learning and its associated technology within a university. If one faculty member has had a poor quality experience with ICT and decided not to use it, then a ripple effect could occur through other faculties and their staff may decide not to try that particular ICT. Similar academic concerns were found in other studies (Friel, Britten *et al.* 2009, Georgina & Hosford 2009, Wickersham & McElhany 2010). Therefore, effective timely and efficient PD should meet the instructional technology and pedagogical needs of academics (Osika, Johnson *et al.* 2009, Reid 2014).

Academic respondents wanted PD delivered in a number of ways, with face-to-face delivery considered the most effective and helpful (Phase 2, 78.8%, n=160, see Chapter 7, Table 7-48). However, attending a PD session and trying a few ICT activities was not sufficient. Respondents from Phase 1 discussed how they thought some PD was a “waste of time’ unless they were able to immediately put what they had learnt into practice (see Chapter 5, section 5.9). Lucas and Wright (2009) concurred with these findings, affirming that mastery of skills and knowledge related to learning these new instructional technologies required more time outside of the workshops for practice leading to adoption. However, as Keengwe, Kidd *et al.* (2009) pointed out, time to practice after the PD session where academics require additional specific CIL implementation was not available (Keengwe, Kidd *et al.* 2009). Academics became frustrated by not having follow-up opportunities to practise with other academics regarding this new E-learning technology. This frustration also extended to the use of ICT and associated technology.

9.11.4 Discussion of integrated finding 4: Academics experienced frustration using ICT and its associated technology

Academics were frustrated by the incompatibilities between software and hardware offered by the university (see Chapter 8 Table 8-2, Chapter 5, section 5.8.4; Phase 2, Table 8-4 category 1B 8.4% (n=25) of academic open responses). In Phase 1 academics expressed how frustrated they were at the unreliability and unpredictability of E-learning. For example, when engaging with the prepared E-learning resource off site or in their office, it would work as predicted. However, in the classroom, the same E-learning resource would either not run or the room was not equipped with speakers, so the dialogue was unavailable for students.

Academics in Phase 1 also found the lack of time (as mentioned previously) to develop E-learning resources frustrating (see Chapter 8 Table 8-2, Chapter 5, section 5.8.4). They expressed frustration regarding the lack of suitable developmental resources on campus. Some academics developed online resources out of hours using the most recent software versions. However, they were further frustrated when the developed resources would not run on the available classroom technology.

These feelings of frustration were exemplified when academics, who were compelled to implement E-learning innovations, found that the promised “ease of use” was not realised and sometimes failed during a class (Priego 2012). Priego (2012) further suggested that this level of frustration may be due to the academic not being “trained enough” or instability of the system. He claimed that a second source of frustration for academics was the lack of education-focused ICT support available and a third source of frustration occurred because of the lack of communication between departments. For example, academics experienced difficulties in sharing E-learning materials due to email file size allocations set by universities, which may have differed from their colleagues’ computers (Priego 2012).

Additional frustration was experienced by academics who wanted to produce high quality E-learning experiences but encountered mismatches among the innovation they wanted to implement, the professional development provided and the system’s capacity to run the developed resource (Wasilik & Bolliger 2009, Islam, Beer *et al.* 2015). Wasilik and Bolliger (2009) also found that students’ lack of engagement with E-learning added to academics’ frustration. In spite of the lack of resources and frustration highlighted above, academics in the current study still reported that they were confident using E-learning and its associated technology.

9.11.5 Integrated finding 5: Nurse academics were confident using E-learning and felt it added value

Both phases of the study indicated that despite negative perceptions of E-learning, academics also expressed confidence in using it (Phase 1, Chapter 8 Table 8-2, Chapter 5, section 5.7; Phase 2, F3, Chapter 7, sections 7.11, 7.12). Respondents described how using the functions in the LMS enabled them to improve their ability to organise and plan ahead, and upload previously developed learning resources in addition to the peer and self-assessment tools, and automatic grading (Phase 1, Chapter 5, section 5.7).

The use of peer and self-assessment tools was seen as another positive aspect of the LMS and these findings were also supported by Scholl and Thomas (2012) and Schwartz (2014). Using the LMS provided academics with the ability to communicate with students and academics (Phase 2, 99.0%, n=201, Chapter 7, Table 7-42). Academics were confident in using E-learning to accommodate for a variety of learning styles, thereby increasing the value of the student learning experience. Learning styles in this thesis refers to the way in which a person prefers to gain knowledge. The Kolb Learning Style Inventory (LSI) (Kolb & Kolb 2005).The LSI is based on the understanding that education should be grounded in experience as in the theory put forward by John Dewey (Kolb & Kolb 2005). The four learning styles include the Accomodator, the Diverger, the Assimilator and the Converger. The Accomodator learns by hands on and active expereimtation while the Diveger uses different points of view while using concrete experience and reflective observation. The Assimilator prefers to learn by reasoning through information in a logical process using a combinaiont of abstract conceptualization and reflective observation. The final of the four learning styles is the Converger who uses active experimentation to test out ideas and theories (Fogg, Carlson-Sabelli *et al.* 2013).

E-learning and learning styles

Academic respondents from Phase 1 discussed how E-learning enabled creative opportunities to enhance students’ experience (see Chapter 5, section 5.7). They commented that E-learning could cater for different learning styles and gave the example of students being more visual learners. These students were able to watch media as well as engage with set readings to gain an understanding of concepts used in the nursing program. Results from the components of F1, “E-learning adds value”, indicated that academics thought E-learning improved student learning (item loading 0.712), and that E-learning increased the interaction between students and academics (item loading 0.679). Academics also indicated that though students learnt more from web-based activities compared to paper-based activities for students (item loading 0.846) (see Chapter 6 Table 6.5).

The researcher's proposition is that in spite of the difficulties, respondents were confidently using a number of aspects of E-learning to achieve their pedagogical outcomes. They were prepared to push through the obstacles, and continue to utilise and develop E-learning resources in their teaching.

The next section focuses on academics' perceived usefulness of E-learning. The Technology Adoption Model (TAM) used to illustrate the student use of E-learning is now used to explain the academic respondents' use of E-learning technology.

9.12 The Technology Adoption Model (TAM) in relation to academics' perceived usefulness of E-learning and its associated technology

As discussed previously in the student integrated findings (see section 9.4), the TAM is the most significant, most commonly used predictor of ICT adoption (Davis 1993, Venkatesh, Morris *et al.* 2003, Venkatesh & Bala 2008, Park 2009, Teo 2014, Fathema, Shannon *et al.* 2015). The TAM is now used to discuss the academic integrated findings based in the identified issues from this study (see Figure 9-3).

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Davis, F. D. (1993). "User acceptance of information technology: system characteristics, user perceptions and behavioral impacts." International Journal of Man-Machine Studies **38**(3): 475-487. P. 481.

DOI http://dx.doi.org/10.1006/imms.1993.1022

URL http://www.sciencedirect.com/science/article/pii/S0020737383710229

accessed 28 /11/17

Figure 9-3 Technology acceptance model (TAM) and academics' perceived usefulness of E-learning and its associated technology

Source: Bagozzi *et al.* (1989 p. 985)

Applying the academic results to the TAM model, the researcher found that academics were located in all five areas, as were the students. This model indicates that perceptions and attitudes towards E-learning and its associated technology would impact on its actual use. Academics who experienced frustration while attempting to use E-learning, or could not access reliable software or hardware, were unlikely to use these technologies. This perception indicated that their *Perceived Ease of Use (PEOU)* and *Perceived Usefulness (PU)* were low (see Figure 9-3). If academics had negative experiences when using the technologies required, their *Attitudes Towards Using (ATU)* could also be negative (see Chapter 5, section 5.8.5). Together, these factors impact on the *Actual Use (AU)* of E-learning. Therefore, based on the TAM model, it is not surprising that most nurse academics had mixed perceptions of the use of E-learning and its associated technology.

The adoption of E-learning and ICT by nurse academics is complex and goes beyond the identification of barriers and enablers, as evidenced by Petit-dit-Dariel, Wharrad and Windle's (2014) study from the United Kingdom. They used Bourdieu's theory of practice and Q-methodology to investigate the interactions between nurse academics in the work context and their behaviour related to the adoption of educational technology. Their results revealed that nurse academics often found themselves pulled in two directions: their previously highly valued and recognised role of working in "hands-on patient care", which they saw as the essence of nursing; and the world of higher education, where their research outputs and grant monies were valued more highly than the actual physical nursing work with patients.

Petit-dit-Dariel, Wharrad and Windle (2014) also found that the motivation to act to adopt educational technology was based on a mix of intentions for each nurse academic. Some were motivated to change their behaviour, and went out of their way to learn and implement E-learning and its associated technology if the perceived usefulness was high and rewards for implementing these pedagogical changes were provided. Others were not motivated to act; they did not see the implementation of E-learning as a priority because they did not perceive the technologies' usefulness (Petit-dit-Dariel, Wharrad *et al.* 2014).

In a similar manner to developing a model of the integrated findings of the student cohort, the researcher has developed a model to illustrate the academics' intention to use E-learning. The model consists of findings from the current study supported by the literature.

9.13 The "academic intention to use E-learning" model

The following model highlights many of the issues related to the academic use of E-learning. It also lists possible strategies to promote its implementation (see Figure 9-4, next page). In this model, the nurse academic lives in the 21st century connected environment. They bring with them their CIL skills, and previous positive and negative experiences of working with ICT.

The red circle and the text above it list the negative issues identified from the current study and the literature that impact on academics and their ability to use E-learning and its associated technology. The yellow circle and text above it include suggested strategies from the researcher that arose from the current study, and which she thought could assist nurse academics who have a positive intention to use E-learning technologies. The green circle and text above it are the reasons why nurse academics from the study were already using E-learning and its associated technology.

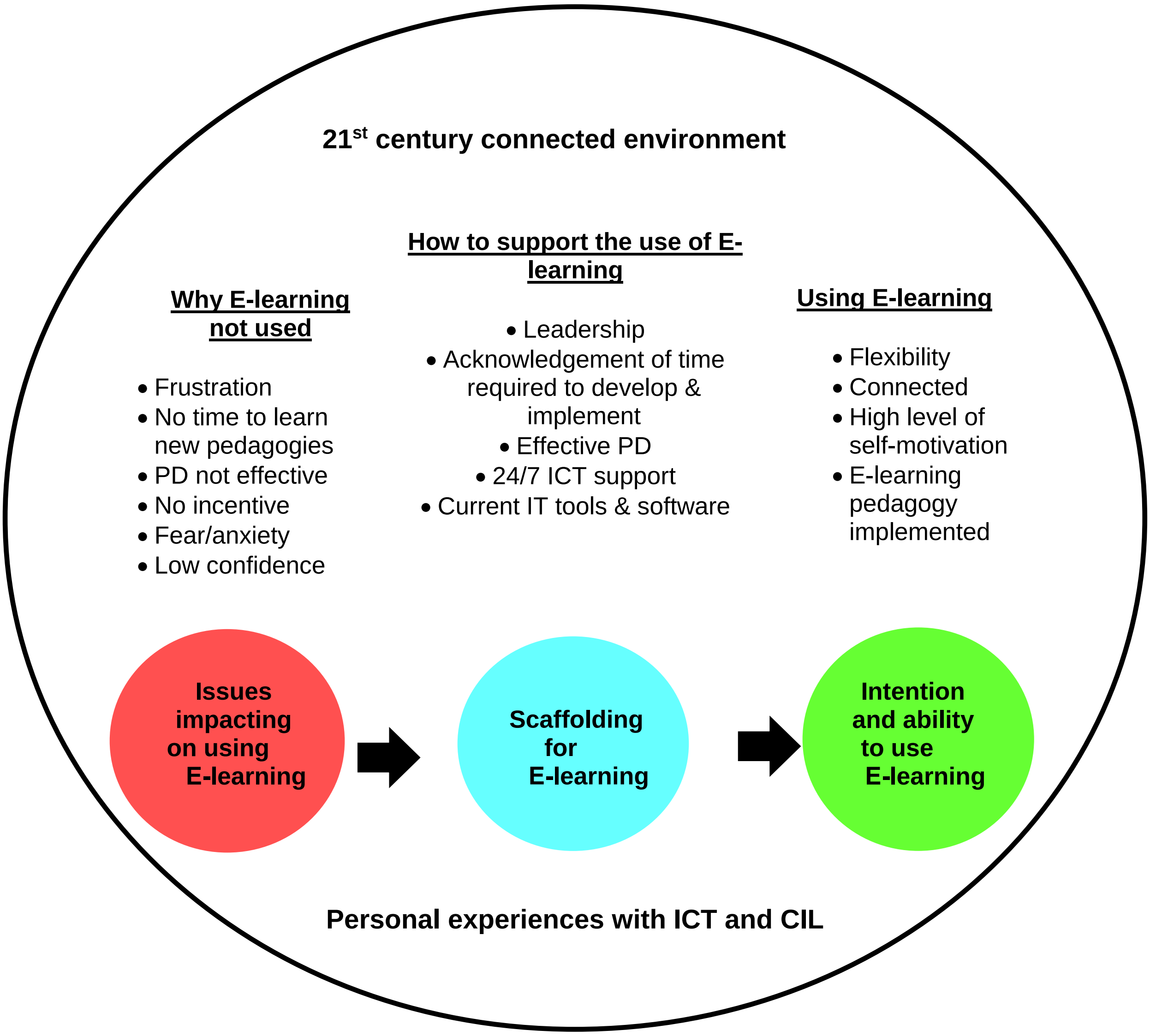

Figure 9-4 The academic intention to use E-learning model

9.14 Summary of integrated academic findings

The discussion of the five integrated academic findings highlighted a lack of leadership and strategic planning surrounding the adoption of E-learning pedagogies by schools of Nursing and Midwifery involved in this study. In spite of this lack of leadership, academics continued to work with these identified barriers and frustrations, including: inadequate classroom multimedia facilities; lack of recognition of their excellence in E-learning in teaching and curriculum development; inadequate time allocation for the development, practice and evaluation of E-learning resources into their current teaching; and finally, professional development that did not provide the pedagogical background required to implement a new learning management facility or software application.

Academics perceived that E-learning added value to the student learning experience. It was because of this insight into student learning that academics were prepared to persist and overcome the many barriers they encountered. Strategies for schools of Nursing and Midwifery to improve leadership and decrease the identified barriers for academics implementing E-learning are discussed in the recommendations in Chapter 10.

The next section discusses the limitations of the study, including the low student response rate and possible sources of bias that need to be considered.

9.15 Limitations of the study

The findings from this study may be applied to schools of Nursing and Midwifery in Australia. However, there are some important aspects that need to be considered. The first phase of the study involved the researcher holding a series of 10 focus groups with a total of over 50 participants at one university, rather than multiple universities. Another consideration is the national response rate, particularly from the undergraduate nursing student population.

9.15.1 National participation rate

The overall participation rate was lower than expected for the schools of Nursing across Australia. At the time of data collection, there were 39 institutions offering approved programs of study leading to a Bachelor of Nursing and/or Bachelor of Midwifery (Australian Health Practitioner Regulation Agency (AHPRA) 2012). Heads of Schools from 23 of the 39 programs replied, with 19 agreeing to permit data collection.

The researcher requested the Head of School to nominate a staff member with whom she would communicate, and who would send out the two emails; one to the student population and one to the academic population. Unfortunately, some staff members did not send out either of the emails, or only sent the email to either the students or the academics. The researcher sent a reminder letter and email to the staff members requesting that they send out the emails, but few responses followed these two requests.

9.15.1.1 Response rates to online questionnaire

It was appropriate to collect the national questionnaire data via electronic medium given that the research involved ICT. However, the response rate for the student questionnaire was only 3.7% of the estimated student enrolment at the participating schools of Nursing and Midwifery at the time of data collection. Response rates to online questionnaires have been reported to be 11% lower than other modes (Manfreda, Bosnjak *et al.* 2008). Petchenik and Watermolen (2011) reported rates as low as 2%.

The questionnaires were prepared following suggestions made in the literature to boost response rates. Suggested strategies included: providing the students with some insight as to why the data was being collected; providing an estimated length of time required to complete the questionnaire; or not compelling answers to allow the questionnaire to progress. In addition, following guides regarding the length and complexity of the questionnaire items, providing a progress bar across the top of the computer screen to allow respondents to see the percentage of the questionnaire completed and sending a reminder email with the link embedded were all seen to encourage participation (Schonlau, Fricker *et al.* 2002, Buckingham & Saunders 2004, Giuseppe 2006, Sue & Ritter 2007).

There was a trend in the student responses from one site. It appeared that one group of students has been permitted to complete the questionnaire towards the end of their class but when the class finished, the students did not complete the rest of the questions. This interruption to the questionnaire completion resulted in 15 questionnaires that were too incomplete to be included.

The response rate for the academic questionnaire was considerably different, with a response rate of 53.3%. Both questionnaires were prepared in the same way, so the difference in response rates suggested to the researcher that academic respondents were eager to have their responses known about the issues they had using E-learning and its associated technology.

9.15.1.2 Response bias

Only students and academics that had a positive or negative interest in E-learning may have responded. The researcher needed to consider that the students and academics who lacked confidence in using ICT may not have responded to the online survey. Perhaps the decision not to participate was out of fear that they may not be able to complete the survey or they may have been asked questions that they could not answer due to their low CIL skills. Reflecting on this possible scenario the proportion of students and academics who held negative perceptions related to E-learning and the associated technology may in fact be higher than the current study suggests. Future researchers should consider using paper-based and online questionnaires to increase the opportunity to reach a wider respondent sample.

9.15.1.3 Self-reported bias

Both student and academic questionnaires were self-reported and therefore subject to reporter bias (Podsakoff, MacKenzie *et al.* 2003, Brutus, Aguinis *et al.* 2012). The researcher took steps to decrease self-reported bias by using the following strategies in the questionnaire:

- Respondents were informed prior to commencing the questionnaire of the anonymous nature of their data and that thier responses would not be made avaibale to the Deans or Heads of their School of Nursing and Midwifery.
- There was 10 items that examined the construct of academic confidence.There was a dedicated section in the Academic's Survey examining willingness and ability to use different E-learning technologies.

9.15.1.4 Time of data collection

Data collection occurred between 2011 and 2012 and could be seen as a limitation in this study due to the speed of developments in this area. However, both the researcher's subsequent experience and the current literature highlight that these issues are still persist today. Therefore the results from this study are seen to be relevant.

9.16 Summary

The focus of this chapter was the discussion of the student and academic integrated findings, supported by contemporary literature and the study's limitations. Discussion of the four integrated student findings revealed many positive aspects concerned with E-learning and its associated technology, which were supported by similar findings internationally.

Therefore, it is contested that while E-learning and it associated technology provide increased flexibility for some students, not all students in schools of Nursing and Midwifery across Australia want to use it. The issues raised by students related mainly to their perceived lack of CIL skills, and frustration and anxiety when using computers. Students were aware of their deficits related to ICT and CIL skills, and wanted more structured opportunities to learn both. The researcher postulates that schools of Nursing and Midwifery in Australia incorrectly assume that commencing students are equipped with, and competent to use, the CIL skills required for their higher education studies. As a result of this incorrect assumption, students are not provided with the structured learning opportunities they need to develop CIL skills to assist them to make the most of E-learning and its associated technology.

The assumption that commencing students will somehow achieve the required CIL skills through an optional library database searching tutorial, either face-to-face or online, should be contested. The researcher believes that the development of CIL skills should be core business and essential to the curriculum. This discussion was elaborated further in the discussion of the integrated academic findings. In addition, the Australian Tertiary Education Quality Standards Agency (TEQSA) Standards Framework for Higher Education also neglects the focus on CIL skills as a required foundation for commencing students (Tertiary Education Quality Standards Agency 2015).

Student respondents experienced levels of anxiety, frustration and fear when their efforts to interact with the LMS and the library databases failed. The support offered by the universities fell short of what the students needed, with many seeking out alternate sources of help from fellow students, family members and friends, as indicated in the Phase 1 findings. These findings also were supported by other studies.

The researcher argues that nursing students' self-reported high levels of ICT anxiety impacted on their level of motivation to use E-learning. In addition, a student's level of anxiety will remain high if E-learning technology is tied to assessment. This finding has implications for the planning of assessable components in undergraduate nursing topics.

The integrated student findings from this study were echoed across the current research literature. Schools of Nursing and Midwifery in Australia need to rectify the shortfall of learning opportunities for students to learn how to use the LMS and library databases. CIL skills acquisition needs to be overt and assessed across the program. Universities need to increase the current dedicated 24/7 student support related to E-learning and its associated technology offered to students in their programs.

It is clear from the discussion of the integrated student findings that education leaders within the discipline of nursing need to act urgently to address the persisting issues related to nursing students' low CIL skills. The "invisible" nature of CIL can no longer be ignored by curriculum designers and national course accreditors. The myth of the "digital native" needs to be put aside. The currently accredited undergraduate nursing education programs should be amended as a matter of urgency. Nursing students require authentic, structured opportunities to learn CIL skills and to have them assessed across the three years of their program. Strategies for schools of Nursing and Midwifery to improve nursing students' CIL skills are discussed in the recommendations in Chapter 10.

The academic respondents were confident using, and teaching with, E-learning and its associated technology in spite of many identified internal and external barriers. The content analysis findings (Chapter 7, section 7.16) indicated that not all schools had easily accessible multimedia resources for staff, nor were resources reliable. This situation seemed to be resolved in other universities as they continued to upgrade their classroom teaching resources; a situation supported in the literature.

The researcher argues that without a strategic plan and leadership in the E-learning area, schools of Nursing and Midwifery have adopted this new pedagogy without acknowledging its complexities. Therefore, the required infrastructure and support are lacking. Consequently, there has been an expectation that academics will just incorporate E-learning into their teaching. In the current study, respondents did not articulate any understanding of their awareness of strategic planning within their organisations for the structured implementation of E-learning. This lack of strategic planning created an absence of recognition of the time required to develop, implement and evaluate E-learning. This challenge is the focus of the second integrated finding.

The lack of reliable, stable, up-to-date technology availability in teaching spaces resulted in frustration for academics. The lack of acknowledgement of time required for academics to develop and learn new instructional technologies, coupled with the lack of time to integrate the new technologies into their current teaching, was also a source of frustration that was supported in the literature. Other researchers found that university administrators lacked the educational knowledge to understand that merely learning how to use an instructional technology was not enough to integrate it pedagogically into an already working curriculum.

Therefore, the researcher contends that although nurse academics are confident and willing to use E-learning resources in their teaching, a number of key concerns remain. Nationally, these key concerns at the time of data collection included: the lack of acknowledgement of the amount of time required to develop and incorporate E-learning; the need for adequate resources; and other institutional barriers.

Many of the causes of frustration with E-learning that have been discussed in this chapter are outside academics' control. This situation continues to persist in the 21st century. These obstacles need to be removed if E-learning is to be adopted more actively. Despite of the difficulties indicated, the participating academics perceived themselves as confident using E-learning technologies. In addition, they were willing to engage in innovative pedagogies to support student learning using these technologies. The academics were prepared to work with these obstacles, many over which they had no control, and continued to use and develop E-learning resources in their teaching.

The researcher emphasises that nurse academics in the study were seeking more pedagogical strategies from professional development (PD) than were available. They sought PD guided by those with expertise in educational design technology, and wanted follow-up opportunities to practise with other academics regarding this new E-learning technology. Lack of these opportunities led to frustration.

In the discipline of Nursing, the researcher contends that students will not have the computer literacy skills required when they enter the health care professional workforce. Graduates are expected to work with the increasing information technology now found in health care. In Australia, the latest change in health care has been the transition to the Electronic Health Record (EHR). In the Australian higher education sector, the researcher is aware there are no resources similar to the EHR that academics can use to enable students to become familiar with the resources they will use in the health care sector. As discussed in this chapter, the literature discusses examples where schools of Nursing have developed their own Academic Electronic Health Record (AEHR), but concerns have been expressed about the set-up costs.

The researcher argues that for Australian nursing students, it is imperative that schools of Nursing and Midwifery prioritise the development of an AEHR as soon as possible. This AEHR would provide the basis for authentic workplace learning and enhance graduates' ability to provide safe, evidence-based care.

Recognition of the study's limitations led the researcher to suggest strategies that may have increased the response rate in Phase 2. The next chapter (10) reviews the research aims and objectives that have been met by the study, followed by recommendations for schools of Nursing and Midwifery in Australia, the Australian Nursing and Midwifery Council (ANMAC), and the Nursing and Midwifery Boards of Australia to consider with the objective of graduating nursing students who are competent, CIL proficient health professionals equipped with the required skills to work in 21st century health care settings.

Chapter 10 Conclusions and Recommendations

10.1 Introduction

This final chapter covers how the aims and objectives of the thesis have been met, discusses recommendations for students and academics arising from the study, and makes recommendations to the professional organisations that regulate nursing practice in Australia to address the gaps identified. The final section discusses recommendations for future research.

10.1.1 Revisiting the study’s aims

The aim of the research was to explore and identify students’ and academics’ experiences of, and perspectives about, current issues related to E-learning and its associated information computer technology (ICT), and their use in nursing education in Australian university undergraduate nursing programs. The study has answered the following questions:

1. To determine the issues involving E-learning and its associated technology for undergraduate nursing students in Australia.
2. To determine the issues involving E-learning and its associated technology for nurse academics teaching in undergraduate programs in Australia.

The researcher used a pragmatic approach from John Dewey, who purports that knowledge emerges out of the learner’s experiences. The study consisted of an explorative, sequential, mixed methods research approach. It used a qualitative then quantitative approach to provide for complimentary and expansion to gain a deeper understanding of the issues and needs of undergraduate nursing students and nurse academics as they use E-learning and its associated technology in Australia. Data was collected, analysed and discussed using contemporary research literature. The following recommendations from the study are now presented for consideration.

10.2 Major issues involving E-learning and its associated technology for undergraduate nursing students in Australia

The first question addressed in this thesis – What are the issues involving E-learning and its associated technology for undergraduate nursing students in Australia? – found four major issues:

- Few students were positive about E-learning
- Students had difficulty with database searching and wanted to learn database searching skills
- Students had low computer literacy skills but wanted to learn ICT skills
- Students experienced frustration and anxiety using computers.

10.2.1 Few students were positive about E-learning

The majority of students in both phases expressed concerns about having to engage with E-learning while feeling that they did not have sufficient computer information literacy (CIL) skills to maximise their learning experience. Students commented that they missed the hands-on learning associated with aspects of nursing. In responses to the open ended questions, students commented that the face-to-face skill intensives were not long enough and did not allow for repeated skill practice.

Therefore, it is recommended that:

- Schools of Nursing and Midwifery across Australia consider offering face-to-face classes as well as online classes to meet the needs expressed by students.
- University ICT and LMS support service hours be made accessible to students 24 hours a day, seven days a week to accommodate the nature of student learning. ICT and LMS support technicians should be available email and phone to take into account situations where the ICT/university server is not working or unavailable.

10.2.2 Students had difficulty with database searching and wanted to learn database searching skills

In order to address the continuing difficulties nursing students experience with searching databases, it is recommended that:

- Schools of Nursing and Midwifery work more closely with university library staff to develop targeted learning activities to scaffold students' skills in database searching aligned to the assessments within the topics. For example, one assessment strategy to establish the level of students' CIL skills relating to database searching could require students to submit their database searching trail to provide evidence of the:
    - Database selected
    - Key words used
    - Date range set
    - Boolean searches undertaken
    - Strategies used to broaden or narrow the search in addition to submitting their assignment.
- Nursing subject/liaison librarians work with academic staff to produce assessment-specific online resources, including short MP4 files that demonstrate how to undertake a database search using common health science databases.
- Casually employed academics are made aware of these resources so they can inform students and demonstrate the database searching to them.

- Assignment development includes marking rubrics that are aligned with the skills required in database searching and submission of completed assessment.
- Topic coordinators (TC) meet with subject librarians and other identified library assistance staff before each semester commences to discuss the assessments in their topics. Together, the TC and the library staff should develop management plans to assist students in the use of library databases. In Australia, it is not unusual to have a topic enrolment of over 500 students.

10.2.3 Students had low computer literacy skills but wanted to learn ICT skills

Findings from both phases of the study revealed that students knew they required additional CIL skills after commencing their studies but were not offered formal learning opportunities as part of their degree. Therefore, it is recommended that:

- Once prospective nursing students have accepted their offer to university, they should receive an email containing an embedded link to a short online learning module. This module would consist of a series of CIL-based learning and would include links to E-learning support services in the university. Schools of Nursing and Midwifery provide support that consists of:
    - Face-to-face small group learning
    - Computer laboratory-based learning
    - Additional online learning activities to build confidence in ICT and CIL skills that will be required to be successful in their nursing studies
    - Student mentors proficient in CIL skills for first year students to guide them in the use of E-learning and its associated technology, including the Learning Management System (LMS).

10.2.4 Students experienced frustration and anxiety using computers

It is recommended that:

- When students are experiencing difficulties with ICT and LMS technologies they should have access to face-to-face or synchronistic learning support so that issues can be resolved immediately.

The next section examines the issues and recommendations relating to nurse academics.

10.3 Major issues involving E-learning and its associated technology for nurse academics in Australia

The second question addressed in this thesis – What are the issues involving E-learning and its associated technology for nurse academics teaching in undergraduate programs in Australia? – found five major issues:

- Lack of E-learning infrastructure and leadership in schools of Nursing and Midwifery across Australia
- Lack of time to develop and incorporate E-learning into teaching
- The need for professional development in regard to ICT and E-learning technologies and pedagogies
- Frustration using ICT, E-learning and its associated technology
- Despite negative aspects associated with E-learning, academics were confident using E-learning and felt it added value.

10.3.1 Academic recommendations

The interrelated nature of the five identified issues led the researcher to present the following recommendations:

- Schools of Nursing and Midwifery acknowledge E-learning as a specialist area of education that requires dedicated leadership that works in coordination with the existing executive structure.
- Not all aspects of nursing curriculum can be taught using E-learning. Academics need to be mindful in selecting E-learning resources so the essence of nursing (high touch human interaction) is not lost through the use of technology.
- E-learning pedagogy is acknowledged as requiring more time and ongoing support from educational design technologists. These specialists would enable academics (who are the nursing content experts) to develop, implement and evaluate innovative online resources.
- Similar to the student recommendation, university ICT and LMS support services need to be accessible to academics 24 hours a day, seven days a week to accommodate the nature of academic work. ICT and LMS support technicians should be available by email and phone to take into account situations where the ICT/university server is not available.
- Schools of Nursing and Midwifery formalise the recognition of excellence of successful E-learning implementation by academics by offering academics incentives consisting of grants, recognition, rewards and compensation (O'Meara 2005, Kidd 2010, Schneckenberg 2010) to encourage E-learning innovation.

- Academics who show innovation should be released from their teaching workload to develop, practise, implement and evaluate resources, and build CIL skills (O'Meara 2005, Kidd 2010, Jeffrey, Hegarty *et al.* 2011).
- Professional development related to E-learning and its associated technology should to be provided to academics by an educational design technologist who is equipped with pedagogical understanding.
- Structured opportunities within schools of Nursing and Midwifery be offered to academics to practice with their peers in order to build confidence with new E-learning technologies before using them in their teaching.
- Implementation of peer coaching by nurse academics who have successfully implemented E-learning resources into their teaching.

The next sets of recommendations from the study focuses on the professional organisations in Australia that are responsible for the regulation of nursing education and practice.

10.4 Professional organisation recommendations

In Australia, two peak professional bodies are involved in nursing education and nursing practice regulation. The first is the Australian Nursing and Midwifery Accreditation Council (ANMAC), an independent accrediting authority of nursing education programs. The second is the Australian Health Practitioner Regulation Agency (AHPRA). This is comprised of 14 national boards, one of which is the Nursing and Midwifery Board of Australia (NMBA). The primary role of the NMBA within AHPRA is to protect the public by setting professional standards and policies that all registered nurses must meet.

The results from this study indicate that urgent additional educational criteria focusing on CIL skills need to be part of the accreditation process, leading to the following recommendations that:

- The ANMAC course accreditation processes include criteria to achieve Nursing Informatics standards, including the assessment and development of ICT skills, CIL development and integration across the program.
- ANMAC education program accreditation seek evidence of how tertiary education providers are facilitating and supporting the learning and assessment of CIL skills across the three years of the program.
- ANMAC program assessors seek evidence from academics employed within the tertiary education provider seeking accreditation as to how ICT skills, CIL development, and integration and assessment are being achieved across the program.
- ANMAC and the Nursing and Midwifery Board of Australia work collaboratively with the Canadian Association of Schools of Nursing (CASN) to adapt the "Nursing Informatics

Entry-to-Practice Competencies for Registered Nurses" for the Australian registered nursing workforce (Canadian Association of Schools of Nursing Association Canadienne des écoles de Sciences Infirmières 2013).

- The Nursing and Midwifery Boards of Australia within AHPRA incorporate Nursing Informatics into the "Standards of Practice for Registered Nurses".

This study also recommends that:

- Schools of Nursing and Midwifery negotiate with government health authorities to gain access to an educational version of the electronic health care system. This system will be known as the "Academic Electronic Health Record" (AEHR).
- Academics receive effective professional development (PD) associated with the AEHR to enable the development of authentic learning opportunities in the university environment. The use of this technology would allow students to develop the CIL skills they will use while undertaking placement in the health care agencies.

The next section presents recommendations for future research in the areas of E-learning, CIL and nursing education.

10.5 Recommendations for future research

This study has identified a number of areas where further research should be undertaken. These are:

- Curriculum development that involves liaison librarians. This research would focus on the overt development of ICT skills for commencing students and the progressive development of CIL skills in addition to Nursing and Midwifery Informatics.
- Investigating and evaluation of the development and implementation of an Academic Electronic Health Record (AEHR).
- Investigation, implementation and evaluation of an AEHR for use by interprofessional health-related students and academics to provide interdisciplinary learning.
- International collaborative research with nurse academics who are involved in the development and implementation of E-learning innovations.
- Nurses' and nursing students' research of the Australian health care system's Electronic Health Record (EHR).

10.6 Conclusion

The simultaneous collection of data from Australian nursing students and academics has not been undertaken previously. The current mixed methods study has identified and increased the understanding of issues encountered by both undergraduate nursing students and academics.

While the findings and recommendations from the study will have most relevance to the participants and cannot be generalised, the study has added further understanding of how internal and external barriers influence how students and academics engage with E-learning and its associated technology.

The study has highlighted that ongoing ICT and CIL learning and support are required for commencing nursing students in spite of their self-reported levels of computer-mediated communication skills. The research has made recommendations of possible strategies that could be implemented to offer the support students require.

Nursing and midwifery academics from the current study are to be applauded for their persistence in incorporating E-learning and its associated technology in their teaching in spite of many external barriers that persist in their working environment. The researcher has provided strategies supported by the literature that may assist in overcoming these barriers. Education program developers need to be selective in the incorporation of E-learning in the current curricula to ensure the very essence of nursing (Routasalo 1999) is not lost but is enhanced by the strategic use of these technologies. Nursing needs to adopt Nursing Informatics' standards for beginning graduates in practice because the standards currently do not exist. Once adopted, these standards will provide benchmarks for used by the Australian Nursing and Midwifery Council to accredit nursing and midwifery programs that lead to an undergraduate degree, including eligibility to register with the Nursing and Midwifery Boards of Australia. The adoption of these additional professional standards will assist nursing graduates to become computer information literate, lifelong learners, as well as providing safe, evidence-based care to the Australian public.

Appendix 1 Information Literacy Competency Standards for Higher Education: Standards, Performance Indicators and Outcomes

(Use the Alt and Left arrow keys to return to previous location in thesis. *Please use these hot keys for all appendices' navigation)

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American Library Association. (2010). "Information Literacy Competency Standards for Higher Education." P8-14.

http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm#ildef Accessed 28/11/17

Appendix 2a Summary of Included Quantitative Studies

(Use the Alt and Left arrow keys to return to previous location in thesis. *Please use these hot keys for all appendices' navigation)

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Fathema *et al*. (2015) USA	To investigate how faculty members' beliefs and attitudes influence their intention and actual use of LMS under conditions of non-mandatory use of LMS in higher education institutions.	n=560 (24%) university teaching staff with (46.79%) female. Most (30.18%) aged between 51- 60 yrs. in 2013.	28-item, researcher-developed validated online anonymous survey. Cronbach's alpha for the 8 scales ranged from 0.87 to 0.93. Structural equation modelling after confirmatory factor analysis.	Perceived self-efficacy. The quality of the Learning Management system (LMS) and technical help, internet infrastructure, hardware, software, training, online help to work with the LMS significantly influence the use of LMS by faculty. Faculty members place emphasis on the quality issues (i.e., functions, contents, navigation speed, and interaction capability) of LMS when considering perceived usefulness and a positive attitude toward the LMS. If faculty have high perceived usefulness and ease of use they are likely to integrate LMS into their teaching.	**Internal** • Perceived self-efficacy • Positive attitude toward the LMS. **External** • Quality LMS • Technical assistance • Staff use the LMS.	III-3	Two sites. Most participants were aged 51 to 60 years.
Kowitlawakul *et al*. (2015) Singapore	To investigate the factors influencing nursing students' acceptance of	n=212 (80.3%) nursing students across all three years of the program.	A cross-sectional, descriptive study design using researcher-developed	Nurse academics need to cultivate positive attitude toward using EHRs as well as increasing their perceived usefulness.	**Internal** • Staff perceived usefulness • Student perceived	III-3	Single site. Focus was on the adoption of electronic health record

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
	the EHRs in nursing education using the extended Technology Acceptance Model with self-efficacy as a conceptual framework.	Mean age 21 years who were using the electronic health record for nursing education (EHRNE) software as part of their studies.	validated self-directed questionnaire. Cronbach's alpha of 0.92. Results were used to develop a structural equation model (SEM).	Students' attitude toward technology is the most influential factor for intention to use.	usefulness.		for nursing education (EHRNE) software. Self-selection bias.
Parkes *et al*. (2015) Australia	To explore student and staff perceptions of the level of preparedness for students for a university E-learning environment mediated by a Learning Management System.	n=20 students & 15 staff from one regional university in New South Wales.	Online survey. 58 E-learning competencies. Hybrid Behavioural Anchored Rating Scale (Hybrid BARS). Rasch analysis.	Students rated themselves as prepared to use ICT but not prepared to use University Learning Management systems. Able to locate web resources, download, upload; unable to critique resources & use critical thinking skills. No E-learning competencies where students identified as being 'very prepared'.	**Internal** • Not prepared for Uni LMS • Low CIL skills.	III-3	Validation of the tool not discussed. No power analysis to justify sample size. Single site.
Porter *et al*. (2015) USA	To determine the degree to which institutional strategy, structure and support decisions facilitate or impede Blended Learning (BL) adoption among higher education faculty.	n=214 (39%) faculty members at a university in the adoption/ early implementation stage, Brigham Young University-Idaho in 2013-14.	Online researcher-developed survey based on Graham *et al*.'s (2013) framework for institutional adoption and implementation of Blended Learning (BL) in higher education.	The availability of sufficient infrastructure, technological support, pedagogical support, evaluation data and an institution's purpose for adopting BL would most significantly influence faculty adoption.	**External** • Tech support • Pedagogical support • Clear purpose for BL • Sufficient infrastructure.	IV	No survey validation process discussed. No Cronbach alpha measure given for scale.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Robertson and Felicilda-Reynaldo (2015) USA	To assess the perceived and applied IL skills of graduate nursing students from two family nurse practitioner (FNP) programs in the midwestern United States.	Cross-sectional descriptive correlational research design. 26 newly graduated family nurse practitioner (FNP) nurses. 14 from public university. 12 from private college.	28-item Information Literacy Self-Efficacy Scale (ILSES) (Kurbanoglu, Akkoyunlu *et al.* 2006). Applied IL skills measured using the modified and validated Beile Test of Information Literacy for Education (B-TILED) instrument (Beile 2005).	FNP nurses demonstrated a high level of confidence in their IL skills but did not perform well in the actual IL skills test. All participants had received some level of IL instruction in the past. Only 50% selected the most effective search methods. Students lacked skills to effectively use bibliographic databases available on the internet. Most also had problems using advanced searching techniques and were more confident with simple search methods.	**Internal** • High self confidence • Low CIL skills.	III-3	Single site. Small sample size. No power analysis to justify sample size.
MacCallum *et al*. (2014) New Zealand	To measure student and educator intention to adopt mobile learning.	n=413 Under graduate business students and 175 academics from two universities and one polytechnic	Researcher-developed two 27-item surveys based on the Technology Adoption Model (TAM) (Venkatesh, Morris *et al.* 2003).	Student and academic ICT anxiety were found to have a strong negative impact on the perception of ease of use for mobile learning. It also had an effect on student perception of usefulness.	**Internal** • High anxiety students and staff • High anxiety decreased perceived usefulness of ICT.	III-3	No assumption that participants had any experience of mobile learning but relied on users' experience with mobile technology. Not clear if courses were fully online or blended.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Murray and Pérez (2014) USA	To assess the digital literacy level of students enrolled in a senior seminar course at a regional university.	n=138 final semester university students across all majors in one university.	Researcher-developed 15 multiple choice questions related to digital literacy across: 1. hardware and operating systems concepts 2. applications software 3. internet and information literacy.	Average score 51% correct. However, if 60% was the pass mark then 72% would have failed.	**Internal** • High self confidence **External** • Low CIL skills.	III-3	Instrument validation process not discussed. Single site. Sample size, power analysis not performed.
Verhoeven *et al*. (2014) Belgium	To measure the self-perception of ICT skills (49 items) and ICT use (53 items) by students.	n=1,180 2nd & 3rd year Bachelor degree students up to the age of 25.	Validated researcher-developed survey of 49 items with 6 sections each with a Cronbach's alpha above 7 to assess ICT learning experience and research orientation as predictors of ICT skills and the ICT use of university students.	Students are not familiar and experience problems with databases, spreadsheets, and communication systems. Except for word processing, female students score lower than male students for all ICT skills. Students from families whose parents graduated in higher education were less capable than other students of applying some ICT skills. The higher the academic self-perception of students, the better digital information literacy scores. Students who learned more from teachers and peers about ICT will use ICT programs for study more	**Internal** • Lack of familiarity leads to perceived lower ICT skills • High confidence leads to high ICT skills.	III-3	Single site. No specific items related to database searching skills. Only 2nd & 3rd year students aged up to 25 included.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
				often than learning from courses. The younger the student when starting to use a computer the more they used ICT in everyday life and study. There is a relationship between the ICT learning experience and the research-oriented identity.			
Weiner (2014) USA	To better understand the extent to which teaching information literacy concepts by faculty occurred in a research university.	n=299 (12%) faculty members who taught undergraduate courses from Agriculture, Education, Engineering, Health and Human Sciences, Liberal Arts, Management, Science and Technology.	Researcher-developed survey based on the Information Literacy (IL) Competency Standards for Higher Education (Association of College and Research Libraries 2010).	Faculty in Education and Management were least likely to provide this instruction. Faculty in Education and Management were least likely to assign a project topic. Faculty in Science were least likely to expect the students to know how to define a topic for a course project before taking the course. Faculty did not assign teaching assistants, collaborate with librarians, or engage other staff to teach these competencies. Tenured faculty tended to provide instruction in defining a topic, finding articles and books, and synthesising	**Internal** • High self confidence **External** • Low CIL skills.	III-3	Survey validation process not covered. Items related to teacher general IL information base and not related to actual database searching skills. Single site.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
				information. Non-tenured faculty tended to teach students to avoid plagiarism.			
Islam (2013) Finland	To assess the possible outcomes of E-learning systems adoption and use.	n=249 students from seven faculties in one university: Humanities, Mathematics and Natural Science, Medicine, Law, Social Sciences, Education, and School of Economics.	Two researcher-developed and validated online surveys administered three months apart to the same participants. Three E-learning systems adoption outcome constructs: • perceived learning assistance • perceived community building assistance • perceived academic performance. Structural equation modelling (SEM) using partial least squares (PLS) used to evaluate the research.	Perceived usefulness of the E-learning system significantly influenced usage. Building a social online community among students and academics is necessary for better academic outcomes in an E-learning environment. Perceived learning assistance predicts students' perceived academic performance. This implies that the students felt the use of the E-learning system was contributing to their learning process in a positive way, and this was reflected in their academic performance.	**Internal** • Perceived usefulness to learning **External** • Building social online presence • Providing learning assistance.	III-3	Self-reported usage due to privacy. Actual usage was not accessed. Did not contain items related to library database searching. Single site.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Roby *et al*. (2013) USA	To identify factors that would enhance student and instructor experiences in online environments.	n=1139 (11%) tertiary students enrolled in an online or blended course, & n=49 (30.4%) instructors who had taught in the online environment.	Two online surveys.	Important elements for students in online learning: • Manageable assessment • Interesting content presentation • Self-paced format • Variety of delivery methods for the content • Availability of technical support (such as helpdesk or TA). Important elements for instructors in online learning: • Technical support including help with accessible materials • Instructional design support • Electronic or web-based material development support • Reassigned time • Course development stipend.	**Internal** • Perceived usefulness to learning **External** • Manageable assessment • ICT tech support • ICT learning design support • Reassigned time to allow development • Money for staff - Course development stipend.	III-3	Face validity only established. Single site. No items related to library database searching skills.
Saadé *et al*. (2013) Canada	To measure intrinsic motivation as an outcome that is influenced by challenge and mediated by anxiety when using E-learning.	n=565 undergraduate students enrolled in Fundamentals of Information Technology Course (FIT).	Survey instrument developed from two validated tools to measure anxiety and motivation related to E-learning.	Student attitudes and anxiety cannot be measured separately due to the idea that beliefs prior to taking an online course introduce negative affect into the learning experience. As student anxiety increases, intrinsic motivation (a form of	**Internal** • Anxiety affects attitudes to ICT usefulness • High anxiety results in low online enjoyment.	III-3	Only anxiety and motivation measured. Single site.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
				enjoyment while learning) decreases.			
Edmunds *et al*. (2012) UK	To explore the influence of work and social/leisure contexts as well as course study on attitudes toward, and take up of, technology.	n=421 students aged 19-59 from Open university courses in social work, computing and business. 58% female.	Researcher-modified Technology Acceptance Model (TAM) (Davis 1989).	Students perceive technology in their work context very positively in relation to both usefulness and ease of use. Students on the different courses surveyed perceived ICT during leisure or social activities as both useful and easy to use at similar levels. The higher students scored ICT at work, the higher the index of actual technology usage. The strongest driver of technology use is perceived usefulness at work. The importance of performance and efficiency as perceived benefits of ICT usage and motivators for their use in general.	**Internal** • Perceived usefulness to learning and work.	III-3	Data collected 2009. Single site. Fully online courses. No items relating library database searching skills.
Lloyd *et al*. (2012) USA	To determine the perceived barriers to online teaching experienced by various faculty groups at a public institution located in the south eastern United States.	n=16 (21.4%) faculty members from one state university who had previously taught in the online environment.	Validated researcher-developed instrument based on barriers from the literature.	Four factors identified **Interpersonal barriers** • Greater resistance by least experienced in teaching online. **Institutional barriers** • Perceived more by older (45-60) academics • Inadequate compensation	**Internal** • Increased resistance by inexperienced teachers • Perceived usefulness to learning. **External** • Intuitional	111-3	Single USA based university study. Small sample size. Teachers taught in fully online learning, not blended E-

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
				for effort. **Training and technology** • Male more proficient than female faculty • More barriers identified by male faculty. **Cost/benefit analysis barriers** • Lack of time • Lack of understanding by departmental leadership and promotions committees about the increased time online teaching takes when compared to face- to-face teaching.	barriers • Inadequate compensation for effort • Lack of time Lack of departmental leadership and promotions committees' understanding about the increased time online teaching takes compared to face-to-face.		learning.
Verhoeven *et al*. (2012) Belgium	To assess whether ICT skills of freshmen change in 6 months at the university. What is the contribution of learning styles (or patterns) to the explanation of the variance in self-perceived ICT skills and the possible change in these skills? And what is the	n=714 (14.4%) 1st year university students in 2004 and repeated in 2005.	Researcher-modified Inventory of Learning Styles (ILS) by Vermunt (1996). Researcher-developed online surveys with 19 items to determine if any change in participants' self-perception of their ICT use and skills had occurred. Results used to develop a structural equation	Student's ability to use the internet or apply basic ICT skills do not improve after commencing university studies. 81% of sample had not had ICT instruction at secondary school. Male students think they are more confident using the internet than women. Students studying for a vocational qualification value the ability to use ICT more than other students.	**Internal** • ICT Skills do not improve over time alone • Male students think they are more confident using the internet than women. **External** • Vocational qualification value the ability to use ICT	III-3	Data collected 2004-2005. Only 1st year students. Modified tool not validated. Strength of SEM in doubt if all items used to determine learning styles were

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
	contribution of learning styles and of gender, social class, and ICT course attendance to the explanation of the variance in these skills?		model.	No difference between working-class students and others in level of ICT skills. Only a weak link between general learning styles and self-perceived ICT skill level. First year student self-perceived ICT skill level did not improve over the year of study.	more than other students.		not included in the survey.
Celik and Yesilyurt (2013) Turkey	To test the effect levels among the latent variables of attitude to technology, perceived computer self-efficacy, computer anxiety, and attitude toward doing computer supported education and these latent variables' ratios to each other	n=471 undergraduate Bachelor of Education students from 3 universities.	Two validated scales were used in an online survey Computer Anxiety Scale developed by (Ceyhan & Namlu 2000) and Technology Attitude Scale (Yavuz 2005),	Positive technology attitude significantly affects perceived computer self-efficacy, computer anxiety, and preservice teachers' decision to use computer supported education in the classroom. Negative technology attitude and high computer anxiety, and low perceived computer self-efficacy together significantly affect the attitude toward using computer supported education in the classroom.	**Internal** • Perceived high self-efficacy with ICT in classroom teaching • Low self-efficacy less likely to use ICT in classroom teaching.	III-3	Not Australian context. Only measured anxiety.
Yu *et al*. (2013) Taiwan	To assess teachers' perceptions toward the relationships between pedagogical use of emerging	n=313 convenience sample from one site of full- and part-time nursing teachers (mean age 39 years &1% female)	Researcher-developed and validated survey. Cronbach's alpha of 0.85.	ICT integration into the classroom depends on: • "intrinsic" factors that concern teachers' personal, fundamental, and pedagogical beliefs about integrating	**Internal** • Pedagogical beliefs about integrating technology in the instructional setting.	III-3	Single site. Self-reported level of competency with ICT tools may be overestimated.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
	technologies and classroom technology infusion.	who taught undergraduate classes during the 2010-2011 academic year.		technology in the instructional setting • "extrinsic" factors, such as lack of adequate access, time, training, and institutional support.	**External** • Lack of adequate access, time, training, and institutional support.		
Zelick (2013) USA	To examine faculty members' perception of Web2.0 technologies on teaching and learning in higher education compared to traditional classroom teaching methods in programs at a higher education institution.	n=177 full-time and part-time faculty members aged between 30-59 years teaching at one public university in the United States.	Researcher-developed online instrument to determine the use of Web2.0 technologies by teaching faculty.	Faculty use in teaching of Web2.0 technologies: • 50.8% did not use Facebook • 42.4% had not used Blogs • 48.6% never used Podcasts • 79.7% never used Second Life • 51.4% never used Skype • 71.2% never used Twitter • 52% never used Wikis • 15.3% never used YouTube. 83% agreed that any use of Web2.0 technologies was self-motived; there was little incentive or reward for attending professional development to learn about Web2.0 technology integration into teaching. Faculty aged 50-69 years had never used Web2.0 technologies. Faculty aged 20-49 used Web2.0 technologies. Faculty 20-29 years were the	**Internal** • Any use of Web2.0 technologies was self-motived learning. **External** • There was little incentive or reward for attending professional development to learn about Web2.0 technology integration into teaching.	III-3	Validation process not discussed. No Cronbach's alpha given, although pilot survey testing was mentioned in researcher acknowledge-ment.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
				highest users of Web2.0 technologies.			
Green (2011) USA	To assess the types and duration of professional development programs offered to staff who teach online.	n=183 senior campus officials responsible for management of online education at the institution.	Online survey about managing online education in higher education.	49% of institutions do not provide mandatory professional development for staff teaching online. 73% agree that faculty resistance to teach online courses is impeding the expansion of online education. 61% agree lack of training instructors and support personnel resources is impeding the expansion of online education. 56% cite lack of institutional funds is impeding expansion of online courses. 69% of institutions have not reorganised the management of online education. 67% do not provide "24/7" ICT support for faculty and students.	**Internal** • Faculty resistance. **External** • Do not provide mandatory professional development for staff teaching online • No 24/7 tech support.	III-3	Not Australian context. Not academic or student-based.
Jacobsen and Andenæs (2011) Norway	To increase undergraduate nursing students' knowledge of	n=480. Quasi experimental design with data	Intervention. One group was subjected to a greater number of	Students from both groups overestimated their ability to search library databases for information.	**Internal** • Over-estimation of CIL skills	II-3	Data from 2004. Small sample

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
	finding and evaluating information from selected bibliographic databases and internet sites.	collected from August 2004 to June 2007. Cohort: Commencing students aged between 20-25 years divided into two groups.	assignments requiring them to find and evaluate bibliographic and internet-based information. The assignments were spread throughout the curriculum. Researcher-developed pre- and post-survey.	The level of knowledge regarding library database searching after three years was similar in both groups. Neither group had sufficient knowledge on graduation to conduct systematic information searches efficiently. This can hinder them from using the best evidence in practice and developing their professional knowledge.	• CIL skills did not improve.		size. Single site. Tool validation process not discussed.
Nguyen *et al*. (2011) USA	To describe nursing faculty's use, knowledge of, and training needs associated with distance learning, simulation, telehealth, and informatics tools in nursing education and practice.	n=193 nursing faculty. 68% over 50 years of age. Located in Western USA.	Online survey developed by the researchers.	More training to increase level to proficient and expert users. Support included: • training • financial • technical support.	**External** • More training • Financial incentive • Technical support.	III-3	Only face validation of tool undertaken. No power analysis to justify sample size. Single site.
Deltsidou *et al*. (2010) Greece	To investigate nursing students' self-reported attitudes on skills in IT use for study purposes.	n=310 undergraduate nursing students. Central Greece.	Flexible learning for postgraduate nurses: a basis for planning, developed by Honey (2004) Cronbach's alpha of 0.80.	Two thirds of the students not skilful in internet usage 88% did not use electronic databases. High cost reported as main obstacle (34.2%) for low internet penetration in	**External** • Cost of access to internet prohibitive • Student low CIL skills.	III-3	Single site from Greece. No power analysis to justify sample size. Not Australian.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
				students. Senior students' competencies were better. The findings of this study indicate that there was a deficit in students' IT competencies.			No academic data collected.
Jetté *et al*. (2010) Canada	To describe college level nursing students' perceptions about their internal and external resources in Nursing Informatics.	Random sample n=131 (33%) in 2008 of college level nursing students completing the college portion of Quebec integrated nursing training. Average age 25 years. French usual language spoken.	Mail survey developed by the researchers measured two main constructs: internal and external resources. Cronbach's alpha 0.96. Internal resources Cronbach's alpha 0.42.	Most students had a computer at home and access to email. 34% had never received any ICT training. 75% had never received database searching training. 86% had never received training about the information system currently being used in the health facilities where they were placed.	**External** • Students had not received ICT or CIL training.	III-3	Data collected in 2008. Scale for internal resources only achieved a Cronbach's alpha of 0.42.
Blake (2009) UK	To determine attitudes toward and use of E-learning among academic staff in nursing and midwifery.	n=102 teaching staff from University in Nottingham.	Survey developed by the researchers.	E-learning accepted by most. Concerns included: • Overtime • Lack of resources • Staff support • Students support • E-learning to supplement rather than replace current teaching methods.	**Internal** • High level of acceptance for E-learning. **External** • Students support • Lack of resources • Staff support.	III-3	Validity not tested. No power analysis to justify sample size. Single site.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Bond (2009) UK	To explore the use that students had made of the internet in the 3 months prior to starting their program, their perceptions of their skill levels and their ability to carry out some basic ICT and online tasks.	n=317 in 2004 and n=386 in 2007. Year 1 nursing students in Bournemouth University.	Paper survey developed by the researchers.	2004 students had poor internet skills & were not frequent users of internet. 2007 students were significantly better. They had skills to do basic IT tasks and higher levels of internet use. BUT skills to access more complex information literacy tasks had not increased. In both studies, skills and age were not related. Nurse education still not integrating the skill and knowledge base essential in undergraduate programs.	**External** • Low level of ICT skills • Lack of ICT integration across curriculum.	III-3	Study examined internet and computer use 3 months prior to enrolment in nursing course. Single site. Tool validity not discussed. No power analysis to justify sample size.
Crews *et al*. (2009) USA	To assess faculty ICT and online professional development needs.	n=197 faculty at University of South Carolina. Approximately 77 % were faculty, 11% were instructors, 22% were graduate assistants.	Online survey developed by the researchers.	Time constraints for: • Preparing new lectures that integrate technology • Learning new technology in order to implement it effectively • Lack of knowledge about new and available technologies • Lack of new and available technologies at the institution • Engaging students using technology • Inadequate training and support on behalf of the institution.	**Internal** • Lack of knowledge about new and available technologies. **External** • Lack of time for resource development • Lack of training • Lack of tech support.	III-3	Validation of tool not stated. Not just nursing students. Not Australian. No power analysis to justify sample size.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Elder *et al*. (2009) USA	To compare student ratings of their computer competency with their performance of those skills on a computer-graded assessment.	n=90 1st & 2nd year nursing students. 19 RN to BSN. Midwestern University.	Survey developed by the researchers. Computer Competency Survey (Cronbach's alpha 0.65).	85% female; mean age 27.25 yrs. Self-assessed computer competency was higher than actual skills. 20% of students mistakenly thought the government controlled all knowledge on the internet.	**Internal** • Over-estimation of CIL skills.	III-3	No power analysis to justify sample size. Not Australian. No academic data collected.
Cooper (2008) USA	To discover the factors which determine why a faculty member does or does not participate in distance education, and what type of adopter defined a faculty member's role in distance education.	n=246 faculty members from 9 universities with 266 faculties.	Online survey developed by the researchers combining 3 tools: Rogers (2003) diffusion of innovation theory Keller (1983) motivation theory Rummler & Brache (1995) human performance theory.	Positive attitude toward distance education. Not ready to be active participants in distance education. Motivation was the number one factor that would increase a faculty member's likelihood to participate in distance education.	**Internal** • Positive attitude to online learning • Lack of motivation of faculty to use online learning.	III-3	Combined tool validity not given; pilot tested once. No power analysis to justify sample size. Not Australian. Nursing faculty unable to be identified from analysis.
Scott *et al*. (2008) New Zealand	To determine use of the internet by nursing students to access health information and their evaluation practices in relation to this information.	n=348 undergraduate students enrolled in a Bachelor of Nursing in Wellington in 2005.	Postal survey developed by the researchers and modified by researcher based on the Health Care Call-back survey developed by Survey Princeton Survey Research	50% response rate. Marked variability to search and evaluate relevant internet health and nursing information. Few respondents assessed patients' use of the internet to gather health information or assisted patients with	**Internal** • Low perceived usefulness of internet information for learning.	III-	No power analysis to justify sample size. Tool not validated after modification. Not Australian. No academic

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
			Associates (2001).	evaluation.			data collected. Not focused on students' learning.
Ely *et al*. (2008) Australia	To assess current knowledge and future training requirements of nurses in information and computer technology to inform policy to meet national goals for health.	n=10,000 nurses in Australia who held member-ship with the Australian Nursing Federation (ANF).	Purposive paper survey instrument.	Barriers to use of information technology: • Low level of skill and training • High workload • Not enough computers • Poor technical support, mainly in more remote and aged care • Lack of recognition by all nurses that information technology is an integral part of nursing.	**Internal** • Low skill level • Lack of recognition that information technology is an integral part of nursing. **External** • High workload • Poor tech support • Lack of training.	III-3	Data collected in 2005. Needed to be a union member and currently employed. Students accounted for 3% of respondents. Survey instrument piloted once but not retested for validity.
Farrell *et al*. (2007) Australia	To examine whether a mainly clinically-based subject can be successfully taught online to undergraduate nursing students.	n=213 1st year nursing students from Tasmania in 2003.	Online survey developed by the researchers adapted from the university's Student Evaluation of Teaching and Learning (SETL) items.	Students concerned over lack of face-to-face contact. Students positive about access to lecturers and IT staff, especially via email. Online learning increased flexibility and time management.	**Internal** • Concerns over lack of face-to-face teaching • Positive toward flexibility of online environment.	III-3	No power analysis to justify sample size. Tool not validated after modification. No academic data collected. Only 1st year students.

Author(s) Year & Country	Aim	Sample	Instruments	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Maag (2006) USA	To collect attitudinal measures toward technology and data on technology instruction to assist educators with developing information technology curricula.	n=743 nursing students from 28 SON in North America.	Developed by the researcher as modification of McFarlane's (1997) Technology Attitude Survey.	Students have positive attitude toward technology. Students were not receiving formal education about information technology during their nursing study program.	**Internal** • Perceived usefulness to learning. **External** • No formal ICT or CIL instruction.	III-3	No academic data collected. No power analysis to justify sample size. Not Australian. Included postgraduate students. Not stated if online or paper survey.
Walker *et al*. (2006) USA.	To compare generational (age) differences among nursing students to their perceived preferences in teaching methods.	n=134 undergraduate nursing students from a Southern state in USA.	Developed by the researcher. Cronbach's alpha was determined to be 0.82.	83% of X & Y generations indicated a preference for lecture over any other teaching method. Nurse academics must look for ways to enhance the learning environment; and develop teaching methods to fit the values, expectations and needs of these students.	**Internal** • Perceived usefulness to learning • Positive toward flexibility of online environment.	III-3	Small sample, single site, with 134 surveys returned. No power analysis to justify sample size. Findings not statistically significant. Not Australian No academic data collected.

Appendix 2b Summary of Included Mixed Methods Studies

Author(s) Year & Country	Aim	Sample	Methods	Sampling Strategy	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Gonen *et al*. (2016) Israel	To measure students CIL skills. To establish through interview CIL skills of nurse academics prior to introduction of Nursing Informatics (NI) into the curriculum.	Qualitative n=6 nurse academics. Quantit-ative n=59 nursing students (n=49 1st year; n=10 2nd year). All students under 30 years of age.	Study priority sequence: qualitative then quantitative. Semi-structured interviews. Researcher-developed survey.	Convenience sampling	CIL skills of students were low. Over 70% had not received basic ICT course. 52.5% had access to a computer at home. CIL and NI skills of academics were low. Academics were keen to improve CIL and NI skills through professional development courses that were successful.	Student Internal • Low CIL skills. • Student External • No CIL skill courses offered • 47.5% had no access to ICT at home. Academic Internal • Low CIL skills • Academics wanted to increase CIL and NI skills. • Academic External • CIL & NI courses well attended when offered.	IV	Single site. Validation of online survey instrument not discussed. No power analysis to justify sample sizes.
Habib and Johannesen (2014) Norway	To uncover the extent and nature of the involvement of academic staff in the processes of acquisition and implement-ation of educational technologies.	Qualitative n=29 staff members from 8 faculties across 5 institutions in Norway. Quantit-ative n=171	Study priority sequence: qualitative then quantitative. Results from interviews formed the basis of the researcher-developed multinational survey.	Purposive snowball for semi-structured interviews.	The network formed by educational technologies, its users and stakeholders is weak. Academic staff had little enthusiasm and level of engagement with the notions of ICT policy. Academics were not clear about what ICT was standard or whether a	Internal • Perceived usefulness to learning. External • Technology and pedagogy seen as separate • IT staff and academics seen	IV	Policy focused. Validation of survey not covered.

Author(s) Year & Country	Aim	Sample	Methods	Sampling Strategy	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
		academics from the same institutions.	Analysis followed the Actor Network theory (Callon & Latour 1981).		standard even existed. Educational mangers said they encouraged ICT use by academics, however, this was not the experience of the academics. Sometimes pedagogy and technology are seen as two discrete entities. Academics were unsure and often unable to contact in administration or be involved in decisions related to technology acquisition and use.	as separate, not working together.		
Bloomfield and Jones (2013) United Kingdom	To explore graduate 1st year nursing students' perceptions and experiences of E-learning when used to supplement traditional methods to learn clinical skills.	n=83 1st year students from an accelerated preregistrat-ion nursing program.	Study priority sequence: qualitative then quantitative.	Focus groups (15 students) followed by pen and paper survey.	Frustration with technical difficulties detracted from satisfaction with E-learning and inhibited use. Students valued highly face-to-face contact with teaching staff even if they were positive about using E-learning. Students found online readings least useful of resources offered.	Internal • Perceived usefulness to learning • Frustration. External • Lack of ICT technical support • Students wanted face-to-face contact time with academic staff.	III-3	Focused on clinical skills. Single site. Sample size.
Taylor and Newton (2013) Australia	To identify facilitators and barriers to systemic implementation	n=39 academic staff. n=10 support	Simultaneous quantitative and qualitative data collections from three groups;	Academic staff - online journaling, interviews, discussion	Resources for "Converged delivery". Students wanted to study at their own pace in a place and time of their	Internal Perceived usefulness to learning.	III-3	Single site. Validation of online survey instrument not

Author(s) Year & Country	Aim	Sample	Methods	Sampling Strategy	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
	of blended learning.	staff. n=472 (3.08%) students.	students, academic staff, and support staff.	forums. Students - online survey and 16 in-depth interviews. Support staff - interviews and discussion forum.	choosing, with resources providing easy access to content. They would communicate using email. Students asked for access to opportunities to improve their low digital literacy skills as well as access to additional required equipment such as headset and microphone. Academics required most support and consistent information when using technology. A whole of university approach to new software and hardware technologies being introduced to ensure compatibility: • evaluation processes are essential to determine teaching and technical requirements and impacts • space and time to explore new and emerging technologies for teaching should be provided. The support staff echoed the findings for academic staff.	External Lack of ICT and E-learning leadership Lack of support for staff to learn and implement new ICT.		discussed. Academic and support sample proportions not given.

Author(s) Year & Country	Aim	Sample	Methods	Sampling Strategy	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
					University leadership at the highest level to support the management of change from dual mode to single mode teaching as pivotal for success in transitioning to "converged delivery".			
Yang *et al*. (2013) Australia	To investigate the first year, online experiences of vocational education and training (VET) pathway students studying at university.	n=529 (52.4% female) 1st year university students with previous VET experience.	Study priority sequence: quantitative followed by qualitative	Survey, researcher-developed focus groups (n=33 participants), and Telephone interviews (n=30 participants).	Students were unable to: • post a message online • locate assessments and announcements posted by lecturer • print their document using campus computing • check their library record online.	Internal • Perceived usefulness to learning.	III-3	Data collection 2009-2010. Validity of survey instrument not established.
Petit-dit-Dariel, Wharrad & Windle (2014). UK	To provide a practical example of how Bourdieu's theory of practice can be employed to better understand nurse educators' responses to ICT	38 nurse educators aged 28-68 years from one higher education (HE) institution	Q methodology and post-sort interviews	Convenience sample from one higher education institution	36 of 38 participants explained 61% of variance Four factors were identified A- the E-advocate B- the humanist C- the septic D- the pragmatic Bourdieu's theory of practice Field= where the nurse educator currently working in HE no longer based in the health agency. Capital = nurse educators	Internal • Educator perceptions of how useful E-learning was for learning or how it detracted from the hands on learning required by students to learn nursing influenced how educators used, intended to use or did not use the technology in their teaching If educators has	III-3	Rigour described Single site

Author(s) Year & Country	Aim	Sample	Methods	Sampling Strategy	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
					now working in HE felt they had lost some of their value as they were no longer working at the beside • Habitus= some nurse educators in HE wanted to keep the hands on aspects of nursing and so were reluctant to adopt E-learning technologies	frustrating experiences they were less likely to explore how these technologies could be incorporated into their current teaching		
Allan *et al*. (2012) United Kingdom	To describe teachers' views of using E-learning for non-traditional students in higher education.	n=48 undergrad. university teachers across nursing, chemistry & management courses.	Study priority sequence: qualitative then quantitative.	Four focus groups followed by thematic analysis.	Non-traditional students' learning needs have not been considered meaningfully in the development of E-learning strategies in universities as teachers try to cope with the massification of, and widening access to, higher education. Quantitative survey results not reported in this article.	**Internal** • Perceived usefulness to learning. External • Lack of support for Non-traditional leaners.	IV	Students not included in focus groups.
Petit-dit-Dariel, Wharrad & Windle (2012). UK	To explore the underlying factors influencing e-learning adoption in nurse education	38 nurse educators aged 28-68 years from one higher education institution	Q methodology and post-sort interviews. Factor analysis	Convenience sample from one higher education institution	36 of 38 participants explained 61% of variance Four factors were identified A- the E-advocate B- the humanist C- the septic D- the pragmatic	**Internal** Educator perceptions of how useful E-learning was for learning or how it detracted from the hands on learning required by students to learn nursing influenced how	III-3	Rigour described Single site

Author(s) Year & Country	Aim	Sample	Methods	Sampling Strategy	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
						educators used, intended to use or did not use the technology in their teaching. If educators has frustrating experiences they were less likely to explore how these technologies could be incorporated into their current teaching		
Moule *et al*. (2010) UK	To explore nursing and health care students' experiences and use of E-learning.	n=35 staff n=41 students from 93 higher education institutions across the UK.	Study priority sequence: quantitative then qualitative.	Purposive sampling. Self-administered postal survey. Invitation to be interviewed face-to-face. Questionn-aire validity established.	Predominant learning is instructivist through virtual learning. Limited experimentation with E-learning and teaching use, linked to key centres of excellence. Systematic approach to staff development. Funding is required to achieve enhanced use of E-learning.	**Internal** • Perceived usefulness to learning. External • Funding required.	III-3	Type of mixed methods study not clear from title. Single site. Survey instrument created by study team not validated beyond question review by 5 staff; not stated if these were part of the research team.
Kelly *et al*. (2009) Ireland	To evaluate an E-learning innovation	n=134 year 1 nursing	Study priority sequence: quantitative	Purposive.	Students positive about flexible and self-management of online	**Internal** • Perceived	III-3	Irish study. Survey

Author(s) Year & Country	Aim	Sample	Methods	Sampling Strategy	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
	designed to teach clinical skills to student nurses.	students. Survey. 14 focus groups in 2005 located in Dublin.	then qualitative.		course. Attitudinal differences between: • male and female mature and non-mature. • Prefer online to blend with face-to-face, not replace it.	usefulness to learning. **External** • Blend with Face-to-face not replace it.		instrument not validated. First years only. Sequence of mixing of data not clear.
Levett-Jones (2009) Australia	To explore nursing students' information and communic-ation technology competence and confidence.	n=1500 1st year undergrad. nursing students from three universities from New South Wales. Four focus groups, total n=24 students.	Study priority sequence: exploratory quantitative then qualitative.	Purposive. Online survey called the *Information and Communicat-ion Technology questionn-aires (ICT).* Followed by focus groups.	Student anxiety when unfamiliar with ICT. Essential that academics draw explicit links between the ICT used in education and in nursing practice.	**Internal** • Perceived usefulness to learning • Increased anxiety with new ICT. **External** • Manageable.	III-3	ICT tool only tested for face validity. Cronbach's alpha score not given so assumed not tested. Only 1st years surveyed.
Nayda and Rankin (2009) Australia	To map information literacy (IL) skills. To asses students' information literacy (IL) skills. To explore students' of their IL skill development.	n=394 Bachelor of Nursing students. One focus group of 7 academics from South Australia.	Study priority sequence: exploratory quantitative then qualitative	Purposive.	Increase students' & academics' understandings of Information literacy (IL) and links to lifelong learning, including staff development: • Collaboration between academics, librarians and study advisors to design and implement progressive curriculum approach to teaching IL skills.	**Internal** • Perceived usefulness to learning. **External** • Academics and Library staff need to collaborate to build students' CIL.	III-3	Tool not validated. Single site.

Author(s) Year & Country	Aim	Sample	Methods	Sampling Strategy	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
	To explore students' and academics' understandings of the link between IL skills and lifelong learning.							
Smith, Salaway *et al*. al.(2009) USA and Canada	To determine the use of ICT by college students.	n=30,616 students from North America and Canada. Focus groups with 62 students. 115 institutions.	Study priority sequence: Sequential; quantitative leading to qualitative	Purposive.	Study repeated annually since 2004. IT is ubiquitous in life of nearly all students. More laptops than desktops. More mobile phones.	**Internal** • Perceived usefulness to learning. **External** ICT devices are being used more than ever.	III-3	Not Australian. Nursing not identified.
Creedy (2007) Australia	To examine graduating Bachelor of Nursing (BN) students' perceptions of a Web-enhanced learning environment, their computer literacy skills and use of technology, and how these	n=266 3rd year students. Queens-land University in Australia.	Study priority sequence: exploratory qualitative then quantitative.	Purposive.	Satisfaction with the Web-enhanced program. Level of information technology (IT) skills. Perceived quality and usefulness of the internet material. Students' had low perception of technical and faculty support for Web-enhanced learning.	**Internal** • Perceived usefulness to learning • Students perceive academics having CIL skills. **External** Current E-learning working satisfactorily.	III-3	Tool development and testing not stated. Not stated if online or paper survey. Not all years tested. No academic data collected.

Author(s) Year & Country	Aim	Sample	Methods	Sampling Strategy	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
	influenced their satisfaction.							
Mitchell *et al*. (2007) UK	To explore undergraduate nursing students' views of web-enhanced learning and to examine issues relating to their pattern of access to a Rehabilitation Nursing module website.	Qualitative n=40 nursing students. Focus group n=6. Quant n=231. Survey from London-derry	Study priority sequence: exploratory qualitative leading to quantitative leading to qualitative	Purposive. Focus group. Self-administered paper survey.	Students who logged on early received the highest grades. 98.9% reported web-enhanced learning because of: • Access to module material (76.9%) • Timely access • Access to 'lost' notes. Issues of equity were cited by 8.8% of students	Internal • Perceived usefulness to learning. External Access to ICT and internet a problem for some students.	III-3	2002/2003 data collected may be out of date now. Not Australian. Small sample for survey. No evidence of validity testing of survey beyond pilot study for length of survey.

Appendix 2c Summary of Included Qualitative Studies

Author(s) Year & Country	Aim	Sample	Method	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Jokinen and Mikkonen (2013) Finland	To describe teachers' experiences of planning and implementing teaching and learning in a blended-learning-based adult nursing program.	n=15 nurse academics teaching 1st year in a Bachelor of Nursing degree in one university in Finland.	Three themed focus groups lasting 90 minutes were audio recorded and transcribed verbatim. Content analysis was performed according to Elo and Kyngäs (2008).	Staff needed ongoing support and professional development to adapt to the changes in pedagogies used in blended learning. Nine themes emerged: • collaborative planning • integration • student group • face-to-face teaching • online learning • learning activities • teaching and learning methods • learning in and about work • confirming competences. Blended learning motivates student learning through the presence of "real life" and relevance to students' own places of work.	**Internal** • Perceived usefulness to learning. **External** • Lack of professional development • Blended, not all online.	IV	Single site. Only academics from 1st year of the Bachelor of Nursing program. Years of teaching experience not mentioned.
Duke and Asher (2012) USA	To examine how undergraduate students find and evaluate information for their research assignments.	n=30 undergraduate students from one university. Part of the Ethnographic Research in Illinois Academic Libraries (ERIAL) study.	Ethnographic interviews and observation.	Students overestimated their information literacy skills. Students: • Lacked basic information literacy that the researchers assumed would have been mastered in high school • Had significant technical difficulties with the electronic interfaces in the library	**Internal** • Perceived usefulness to learning • Students overestimated CIL skills. **External** • More ICT technical support	IV	Data collected from one site 2008-2009.

Author(s) Year & Country	Aim	Sample	Method	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
				• Could not locate books in the library stacks • Relied on Google to locate resources • Would fit their assignment topic to the resources they could locate • Believed the first few resources they located were good if they were in the library • Were overwhelmed by the amount of information they located • Only read the first 2 pages of the resources to evaluate suitability.	for students.		
Regan *et al*. (2012) USA	To expand existing research on the barriers of instructors' experience in online learning environments (OLEs).	n=6 instructors. Purposeful sampling of instructors teaching in different Online Learning Environments (OLE) format, e.g., asynchronous, hybrid and synchronous via video-conferencing.	Two focus groups. Audio recorded transcripts transcribed verbatim and returned to members for checking prior to analysis. Iterative coding process.	The central emotions expressed by the OLE instructors were captured in the following five themes: (a) restricted (b) stressed (c) devalued (d) validated (e) rejuvenated. The themes suggest the changing nature of instructors as they enter the OLE with initial perceptions that evolve over time with experience and skill enhancement .	**Internal** • Perceived usefulness to learning • Emotional growth process to teach on OLE.	IV	No student sample.

Author(s) Year & Country	Aim	Sample	Method	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Smyth *et al* (2012) Ireland	To describe the students' experiences of taking a blended learning postgraduate program in a school of Nursing and Midwifery.	n=51 (94% female) postgraduate nursing students in one school. With 2-30 years' nursing experience. Age range 23-50 years.	Focus groups held six months before the end of their course. Thematic data analysis according to Burnard (1991).	Two main themes: *Benefits of blended learning* • Accessibility and flexibility • Autonomy and responsibility • Application to practice • Enhanced learning. *Challenges of blended learning* • Feeling isolated • Maintaining a sense of community • Invasiveness of blended learning • Feeling overwhelmed • Technological problems • Blogging and e-activities. • Absence of prompt feedback.	**Internal** • Perceived usefulness to learning • Perceived isolation in online learning • Feeling overwhelmed. **External** • Lack of ICT technical support • Lack of prompt academic feedback online.	IV	Single site. Postgraduate. Self-selection bias.
Anderson *et al*. (2013) UK	To investigate the information literacy skills and experiences of students taking a year long, part-time pre-entry course designed to help participants choose a course of study and develop confidence in their ability to study at 1st year	n=18 mature age students enrolled in part-time pre-entry course at a university in 2010 and 2011. 50% female. Age range from 20-70 years old.	Individual interviews using semi-structured theme related to locating information for classes and assignments. Analysis by constant comparative method (Strauss & Corbin 1990).	Students were: • Unable to articulate their search process for resources • Unable to differentiate between knowledge and information • Suspicious of resources found on internet; preferred the "truth" found in books from the library • Reading set materials multiple times as their way of studying • Mature age students did not	**Internal** • Suspicious of online resources due to low CIL skills.	IV	Single site. Interview questions not provided in article.

Author(s) Year & Country	Aim	Sample	Method	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
	university standard.			rely on peers for information and were somewhat disconnected from peers • Specific interrelated elements such as Information literacy, Epistemology, Metacognition need to be integrated into pre-entry courses.			
Risquez and Moore (2013) Ireland	To utilise two key psychoanalytical concepts - individuation and congruence - in order to analyse individual responses to organisational change and to propose a tentative framework for considering psychoanalytical dynamics when organisational change is proposed, or underway.	146 (33%) faculty from one Irish university where technology enhanced learning had been implemented in some parts of the institution, including teachers, researchers, administrators and librarians.	Researcher developed an anonymous online survey of open ended questions regarding the proposed organisational changes involving teaching with technology followed by direct content. Direct content analysis (Hsieh & Shannon 2005).	Nine archetypes of the individuation-congruence change framework emerged from the responses, moving from: High Individuation and Low Congruence: • High -The rebel • Medium - The sceptic • Low - The detached. • To High Individuation and Medium Congruence: • High - The individualist • Medium -The undecided • Low - The ambivalent. To High Individuation and High Congruence • High - The pioneer • Medium - The engaged • Low - The dependent. The framework can be used during the implementation of ICT in institutions to target support for individuals.	Internal • Academics vary across the change management continuum • Rebellious • Sceptical • Ambivalent.	IV	Direct content analysis was not checked for reliability between coders. Sample size limited. Single site.

Author(s) Year & Country	Aim	Sample	Method	Key Findings	Internal or External Drivers	Level of Evidence (NHMRC 2011)	Critique
Killion *et al*. (2011) USA	To gain an understanding of student nurses' experiences in asynchronous online learning.	n=18 RN students completing BSN.	Focus groups with 8 structured questions followed by La Pelle's (2004) thematic analysis.	Students moving from traditional face-to-face to online learning experienced the following themes in "becoming an online learner": • Disengaging from traditional face-to-face instruction • Isolated • Overwhelmed • Convenient • Preferred type of learning • Getting into the rhythm- familiarisation with navigation. Low CIL levels impeded progress: • Distrustful of online environment • Acceptance of technology • Assuming a new identity- students' online competence and confidence increased as the courses progressed • Being actively involved online • Asking for help from other students • Offering encouragement to fellow students • Managing time different for online courses.	Internal • Feeling overwhelmed at the start of using E-learning • Perceived usefulness to learning. External • Low CIL skills and no support.	IV	Academics not included in the study. Participants were already RN.

Author(s) Year & Country	**Aim**	**Sample**	**Method**	**Key Findings**	**Internal or External Drivers**	**Level of Evidence (NHMRC 2011)**	**Critique**
Bembridge *et al*. (2011) Australia	To explore whether the information and communication technology (ICT) skills nurses acquired at university are relevant and transferable to contemporary practice environments.	n=8 new graduate nurses, 6 female, 2 male from New South Wales.	Descriptive qualitative study.	Pre-transition phase: Failure to recognise clinical relevance of ICT skills gained at university & transferability to the workforce. Transition phase: Skills from Uni facilitated this phase - ICT skills, knowledge, most important for self-efficacy. Organisational barrier: Slow, no repairs, not enough ward computers.	Internal • Perceived usefulness to employment. External • Slow ICT repairs • Not enough ICT equipment.	IV	Participants only from one university in Australia. No academic data collected.
Smith G.G. *et al* (2009) USA	To investigate nursing instructor experiences in online learning.	n=9 (n=7 instructors, n=2 instructional designers) within colleges of nursing in Tampa Florida.	Descriptive qualitative study.	Faculty require: • Support • Sufficient time to develop courses • Adequate assessment. Need to ensure the quality of online courses.	External • Lack of time • Lack of ICT development support.	IV	Not stated if academics were teaching pre- or post-registration classes. No class sizes given.

Appendix 2d NHMRC Evidence Hierarchy: Designations of ‘levels of evidence’ according to type of research question

This table has been removed due to copyright restrictions

National Health and Medical Research Foundation. (2011). "NHMRC additional levels of evidence and grades for recommendations for developers of guidelines - Stage 2 Pilot "   Retrieved 21 June 2011, from

https://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/levels_grades05.pdf *accessed 28/11/17*

Appendix 4 Ethics Approval

(Use the Alt and Left arrow keys to return to previous location in thesis. *Please use these hot keys for all appendices' navigation)

Flinders University and Southern Adelaide Health Service

SOCIAL AND BEHAVIOURAL RESEARCH ETHICS COMMITTEE

Room B1, Union Building, Flinders University,
GPO Box 2100, ADELAIDE SA 5001
Phone: (08) 8201 3116
Email: human.researchethics@flinders.edu.au

FINAL APPROVAL NOTICE

Principal Researcher:	Ms Didy Button
Address:	School of Nursing & Midwifery
Project Title:	E-learning: An exploration of the technology and its use for students and academics in nursing and midwifery programs in Australia
Project No.:	**4428**
Approval Expiry Date:	**31 March 2013**

The above proposed project has been **approved** on the basis of the information contained in the application, its attachments and the information subsequently provided.

In accordance with the undertaking you provided in your application for ethics approval for the project, please inform the Social and Behavioural Research Ethics Committee, giving reasons, if the research project is discontinued before the expected date of completion.

You are also required to report anything which might warrant review of ethical approval of the protocol. Such matters include:

- serious or unexpected adverse effects on participants;
- proposed changes in the protocol; and
- unforeseen events that might affect continued ethical acceptability of the project.

In order to comply with monitoring requirements of the *National Statement on Ethical Conduct in Human Research (March 2007)* an annual progress and/or final report must be submitted. A copy of the pro forma is available from http://www.flinders.edu.au/research/info-for-researchers/ethics/committees/social-behavioural.cfm. Your first report is due on **11 May 2010** or on completion of the project, whichever is the earliest. *Please retain this notice for reference when completing annual progress or final reports.*

A Jacobs

Andrea Jacobs
Acting Secretary
Social and Behavioural Research Ethics Committee
15 May 2009

cc: Dr Ann Harrington, Nursing & Midwifery
Dr Jane Neill, School of Nursing & Midwifery
Dr Ingrid Belan, School of Nursing & Midwifery

NB: ***If you are a scholarship holder and you receive funding for your research through the National Health & Medical Research Council please forward a copy of this letter to the Head, Higher Degree Administration and Scholarships Office, for forwarding to the NHMRC.***

Flinders University and Southern Area Health Service

SOCIAL AND BEHAVIOURAL RESEARCH ETHICS COMMITTEE

Research Services Office, Union Building, Flinders University
GPO Box 2100, ADELAIDE SA 5001
Phone: (08) 8201 3116
Email: human.researchethics@flinders.edu.au

FINAL APPROVAL NOTICE

Principal Researcher:	Ms Didy Button
Email:	didy.button@flinders.edu.au
Address:	School of Nursing & Midwifery,
Project Title:	E-learning: An exploration of the technology and its use for students and academics in Nursing and Midwifery programs in Australia

Project No.:	**5094**	Final Approval Date:	9 May 2011	Approval Expiry Date:	**30 March 2013**

The above proposed project has been **approved** on the basis of the information contained in the application, its attachments and the information subsequently provided.

If you have any outstanding permission letters (item D8), that may have been previously requested, please ensure that they are forwarded to the Committee as soon as possible. Additionally, for projects where approval has also been sought from another Human Research Ethics Committee (item G1), please be reminded that a copy of the ethics approval notice will need to be sent to the Committee on receipt.

In accordance with the undertaking you provided in your application for ethics approval for the project, please inform the Social and Behavioural Research Ethics Committee, giving reasons, if the research project is discontinued before the expected date of completion.

You are also required to report anything which might warrant review of ethical approval of the protocol. Such matters include:

- serious or unexpected adverse effects on participants;
- proposed changes in the protocol (modifications);
- any changes to the research team; and
- unforeseen events that might affect continued ethical acceptability of the project.

To modify/amend a previously approved project please either mail or email a completed copy of the Modification Request Form to the Executive Officer, which is available for download from http://www.flinders.edu.au/research/info-for-researchers/ethics/committees/social-and-behavioural-research-ethics-committee/notification-of-committee-decision.cfm. Please ensure that any new or amended participant documents are attached to the modification request.

In order to comply with monitoring requirements of the *National Statement on Ethical Conduct in Human Research (March 2007)* an annual progress and/or final report must be submitted. A copy of the pro forma is available from http://www.flinders.edu.au/research/info-for-researchers/ethics/committees/social-behavioural.cfm.

From:	Human Research Ethics
To:	Didy Button; Ann Harrington; "Ingrid Belan"
Subject:	5094 SBREC - Modification No. 1 approved (20 March 2013)
Date:	Wednesday, 20 March 2013 3:05:00 PM
Importance:	High

Dear Didy,

The Executive Officer of the Social and Behavioural Research Ethics Committee (SBREC) at Flinders University has reviewed and approved your request for an extension of time for project 5094. A modification ethics approval notice can be found below.

MODIFICATION (No.1) APPROVAL NOTICE

Project No.:	**5094**
Project Title:	E-learning: An exploration of the technology and its use for students and academics in Nursing and Midwifery programs in Australia
Principal Researcher:	Ms Didy Button
Email:	didy.button@flinders.edu.au
Address:	School of Nursing & Midwifery

Modification Approval Date:	20 March 2013	Ethics Approval Expiry Date:	**30 August 2015**

I refer to your modification request for the project above that has been approved previously. I am pleased to inform you that the Executive Officer has approved your request to modify the project as outlined below:

✓	Approved Modification(s)	Details of approved modification(s)			
✓	Extension of Time:	From:	30 March 2013	To:	30 August 2015

RESPONSIBILITIES OF RESEARCHERS AND SUPERVISORS

1. **Participant Documentation**

   Please note that it is the responsibility of researchers and supervisors, in the case of student projects, to ensure that:

   - all participant documents are checked for spelling, grammatical, numbering and formatting errors. The Committee does not accept any responsibility for the above mentioned errors.
   - the Flinders University logo is included on all participant documentation (e.g., letters of Introduction, information Sheets, consent forms, debriefing information and questionnaires – with the exception of purchased research tools) and the current Flinders University letterhead is included in the header of all letters of introduction. The Flinders University international logo/letterhead should be used and documentation should contain international dialling codes for all telephone and fax numbers listed for all research to be conducted overseas.
   - the SBREC contact details, listed below, are included in the footer of all letters of introduction and information sheets.

From:	Human Research Ethics
To:	Didy Button; Ann Harrington; Ingrid Belan
Subject:	5094 Modification No.2 approval notice (19 May 2015)
Date:	Tuesday, 19 May 2015 1:19:26 PM
Importance:	High

Dear Didy,

The Executive Officer of the Social and Behavioural Research Ethics Committee (SBREC) at Flinders University has reviewed and approved the extension of time request that was submitted for project 5094. A modification ethics approval notice can be found below.

MODIFICATION (No.2) APPROVAL NOTICE

Project No.:	**5094**
Project Title:	E-learning: An exploration of the technology and its use for students and academics in Nursing and Midwifery programs in Australia
Principal Researcher:	Ms Didy Button
Email:	didy.button@flinders.edu.au

Modification Approval Date:	19 May 2015	Ethics Approval Expiry Date:	**30 July 2016**

I am pleased to inform you that the extension of time request submitted for project 5094 on the 19 May 2015 has been reviewed and approved by the SBREC Chairperson. A summary of the approved modifications are listed below. Any additional information that may be required from you will be listed in the second table shown below called 'Additional Information Required'.

Approved Modification(s)	Details of approved modification(s)			
Extension of Time:	From:	30 August 2015	To:	30 July 2016

	Additional Information Required
1.	None.

RESPONSIBILITIES OF RESEARCHERS AND SUPERVISORS

1. Participant Documentation

Please note that it is the responsibility of researchers and supervisors, in the case of student projects, to ensure that:

- all participant documents are checked for spelling, grammatical, numbering and formatting errors. The Committee does not accept any responsibility for the above

From:	Human Research Ethics
To:	Didy Button; Ann Harrington; Ingrid Belan
Subject:	5094 SBREC modification No.4 approval notice (24 August 2016)
Date:	Wednesday, 24 August 2016 3:36:05 PM
Attachments:	5094 modification request No.4.msg
Importance:	High

Dear Didy,

The Chairperson of the Social and Behavioural Research Ethics Committee (SBREC) at Flinders University has reviewed and approved the modification request that was submitted for project 5094. A modification ethics approval notice can be found below.

MODIFICATION (No.4) APPROVAL NOTICE

Project No.:	**5094**
Project Title:	E-learning: An exploration of the technology and its use for students and academics in Nursing and Midwifery programs in Australia
Principal Researcher:	Ms Didy Button
Email:	didy.button@flinders.edu.au

Modification Approval Date:	24 August 2016	Ethics Approval Expiry Date:	**30 December 2017**

I am pleased to inform you that the modification request submitted for project 5094 on the 16 August 2016 has been reviewed and approved by the SBREC Chairperson. Please see below for a list of the approved modifications. Any additional information that may be required from you will be listed in the second table shown below called 'Additional Information Required'.

Approved Modifications	
Extension of ethics approval expiry date	X
Project title change	
Personnel change	
Research objectives change	
Research method change	
Participants – addition +/- change	
Consent process change	
Recruitment process change	
Research tools change	
Document / Information Changes	
Other (if yes, please specify)	

Please note the following documents are available from the researcher on request

Phase 1

- Letter to Dean of School of Nursing seeking permission to undertake focus group research with students and academic staff
- Focus groups consent forms. Student and Academic
- Letters of Introduction Student and Academic
- Information sheets Student and Academic
- Focus group recruitment emails Student and Academic

Phase 2

- Letter to Dean of School of Nursing seeking permission to undertake research with students and academic staff
- Proforma letter of reply for Dean of School of Nursing to accept students and academic staff being involved in national online questionnaire
- Email to the designated school staff member responsible to send out both students and academic links to the online questionnaire

Appendix 6a Review of Student ICT attitude survey instruments 2005-2010

(Use the Alt and Left arrow keys to return to previous location in thesis. *Please use these hot keys for all appendices' navigation)

Author and Country	Name of instrument	Population	Sample size	Reliability	Instrument Strengths	Instrument Weaknesses	Questions used
Morris *et al.* (2009) USA	The Attitudes Toward Computer Usage Scale version 2 (ATCUS v. 2.0) First version developed in 1986 by Popovich	Students were recruited using the university psychology experiment participant pool. 94% Caucasian with 142 females and 112 males with a mean age of 19.28 and a range of 18–36 years.	254 students	The Attitudes Toward Computer Usage Scale version 2 (ATCUS v. 2.0) was found to have both high internal consistency, alpha = 0.83 and test–retest reliability, r = 0.93.	The development of the (ATCUS v. 2.0) The four factors were labelled as follows: (1) Positive reactions to computers, (2) Negative reactions to computers, (3) work/education applications and uses, (4) Social/ recreation/shopping applications and uses.	Long tool 39 items. Items relating to shopping not relevant to current study	Para-phrased question related to internet access and outdated software and university equipment were used
Smith *et al.* (2009) USA	ECAR Study of Undergraduate Students and Information Technology, 2009.	College and university students.	30,616 in 2009	Validated by expert panel annually to ensure contextually relevant	Items reflect current ICT used in Australian Higher education settings. The instrument has been used annually since 2004. Results will be able to be compared with current study results		Permission to use items from tool granted. See Appendix 7E and 7K.

Author and Country	Name of instrument	Population	Sample size	Reliability	Instrument Strengths	Instrument Weaknesses	Questions used
Sun *et al.* (2008) Taiwan	No name given but the focus was E-learner satisfaction To investigate the critical factors affecting learners' satisfaction in e-Learning	Two public universities in Taiwan participated in the study. A total of 645 surveys were distributed by email	The initial and follow-up mailing generated 295 usable respons-es, resulting in a response rate of 45.7%	The reliability of each factor was as follows: perceived e-Learner satisfaction 9 items α = 0.93; learner attitude toward computers 8 items α = 0.72; learner computer anxiety 4 items α = 0.86; learner Internet self-efficacy 13 items α = 0.89; E-learning course flexibility 8 items α = 0.87; E-learning course quality 3 items α = 0.83; Technology quality 4 items α = 0.82; Internet quality 4 Items α = 0.50; Perceived usefulness 4 Items α = 0.91; perceived ease of use 4 Items α = 0.90; Learner perceived interaction with others 9 items α = 0.80.	Items focused on E-learning design and E-learning course management. Developed for students undertaking fully online courses. Items had similar emphasis to the ECAR survey (Smith, Salaway *et al.* 2009)	Developed in Taiwanese the English translation is sometimes grammatic-ally incorrect. Respondents were undertaking fully online courses.	

Author and Country	Name of instrument	Population	Sample size	Reliability	Instrument Strengths	Instrument Weaknesses	Questions used
Teo (2008) Singapore	Modified Computer Attitude Questionnaire (CAQ) for use primary school students. The purpose of this study was to explore the computer attitudes of students.	Students in post-secondary education. Their mean age was 18.3 years (SD = 1.20) and consisted of 107 males (58.5%) and 76 females (41.5%)	183 students	Computer importance 6 items (CI) α=).82 Computer enjoyment 6 items (CE) α= 0.82 Computer anxiety (CA) 8 items α= 0.84	Developed for students for whom English was their second language. Items included Computer importance (CI) Computer enjoyment (CE) Computer anxiety (CA) Overall computer attitudes	Did not include use of internet and learning management systems. Not developed for adult students	

Appendix 6b Review of Academic ICT attitude survey instruments 2000-2010

(Use Alt and Left arrow to return to text)

Author & Country	Name of instrument	Population	Sample size	Reliability	Strengths	Weaknesses	Questions used
Crews *et al.* (2009) USA	Assessing Faculty's Technology Needs	Higher education staff at the University of South Carolina	197 staff 77% of all Faculty staff	Overall instrument Cronbach's α = 0.84	Items covered main issues from Phase 1 of study. Items were contextually relevant to higher education. Covered items relating to professional development. Results will be able to be compared with current study results		Permiss-ion to use 50 items from tool granted. See Appendix 7G.
Kao and Tsai (2009) Taiwan	Web-based Professional Development Self-Efficacy questionnaire (WPDSE) survey	20 primary schools.	421 primary school teachers	The reliability coefficients for the five scales of the AWPD, respectively were α =0.92 (perceived usefulness, 5 items), α= 0.92 (perceived ease of use, 5 items), α = 0.87 (affection, 3 items), α =0.88 (anxiety, 3 items) and α =0.93 (behaviour, 5 items)	Covered primary school teacher self-efficacy using the internet basic skills. Interactions during web-based professional development courses, Skill application following web-based professional development. Scale to determine perceived usefulness of web-based professional development	Examined only web-based professional development and not other ways of offering professional development.	None

Author & Country	Name of instrument	Population	Sample size	Reliability	Strengths	Weaknesses	Questions used
Mahdizadeh *et al.* (2008) Netherlands	E-learning in higher education	Teacher in higher education	A sample of 178 teachers in MSc programs at Wageningen University participated in this study.	Factor 1: Knowledge construction teaching and learning approach (KC) α = 0.73 Factor 2: Teachers' opinion about computer-assisted learning (CAL) α = 0.72 Factor 3: Teachers' opinion about web-based activities (WA) α = 0.7 Factor 4: Ease of use (difficulty) α =0.7	The tool assessed teachers' perceived added value of e-learning environments as part of their general attitude and opinion about computers and the web.		Permiss-ion to use items from tool granted. See Appendix 7K used for Educator scale.
Tondeur *et al.* (2008) Belgium	To analyse the relationship between primary school teachers' educational beliefs and their typical approach to computer use in the classroom by students	Teachers from 70 primary schools.	574 elementary school teachers	High internal consistency level for "basic computer skills" (α = 0.81), "computers as an information tool" (α = 0.83) and "computers as learning tools" (α = 0.77).	.	Focus was on teachers' pedagogical underpinning and how it influenced their use of ICT in the classroom. Did not cover issues of use by educators instead focusing on how ICT should be used by students in the classroom	None

Author & Country	Name of instrument	Population	Sample size	Reliability	Strengths	Weaknesses	Questions used
Ward and Moule (2009) United Kingdom	Information technology attitude scales for health (ITASH) questionnaire	Three NHS trust staff To assess health professionals' attitudes to IT-use in the workplace.	150 mixed health professional staff	Factor 1 α= 0.88 (n=150) Factor 2 α= 0.70 (n=150) Factor 3 α= 0.83 (n=150)	Scale included items that included education for health care professionals. All health professional groups were included in the study	Developed for the health care agency environment not for the higher education environment Does not assess education focus IT use	None
Wasilik and Bolliger(2009) USA	Online Faculty Satisfaction Survey (OFSS) To determine level of satisfaction with teaching only online.	Faculty from the University of Wyoming	102 instructors who taught in a fully online environment	After data collection α = 0.87	Items included ICT equipment difficulties. Scale to determine Facility satisfaction with teaching fully online. positive level of faculty satisfaction with online	Items' focus was for faculty who taught only in the online environment. Did not include any physical classroom equipment items	None

Appendix 6c Permission to use the ECAR 2009 study survey instrument

----- Forwarded message from Ron Yanosky <ryanosky@educause.edu> -----
Date: Thu, 2 Sep 2010 17:51:42 -0600
From: Ron Yanosky <ryanosky@educause.edu>
Reply-To: Ron Yanosky <ryanosky@educause.edu>
Subject: ECAR survey instrument
To: didy.button@flinders.edu.au

Hi Didy,

Your inquiry about using ECAR's 2009 student survey instrument was passed along to me. We are pleased to grant you permission to use it for the research work at Flinders University School of Nursing and Midwifery that you describe below. Please be sure to attribute the material you use to the EDUCAUSE Center for Applied Research and to note that the copyright is held by EDUCAUSE.

This permission pertains to the ECAR survey instrument only. I believe Nancy Hays has responded with respect to the other item you asked about.
Please don't hesitate to contact me if I can be of any further assistance.

Best of luck with your work, and thanks for contacting us.

Ron
Ron Yanosky, PhD

Acting Director and Senior Fellow
EDUCAUSE Center for Applied Research
4772 Walnut St. Suite 206
Boulder, CO 80301
+1 720-406-6747

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-----Original Message-----

From: info@educause.edu [mailto:info@educause.edu] On Behalf Of didy.button@flinders.edu.au

Sent: Tuesday, August 31, 2010 10:09 PM
To: General
Subject: [.EDU Request] Seeking permission to use survey tools
Didy Button sent a message using the contact form at
http://www.educause.edu/contact.
Flinders University is a member of EDUCAUSE.

I am a fulltime staff member and a higher degree research student at Flinders University School of Nursing and Midwifery Adelaide Australia. I am seeking copyright and author permission to use the following survey tools in my research "E-learning: An exploration of the technology and its use for students and academics in Nursing and Midwifery programs in Australia."
1. Students and Information Technology in Higher Education: 2009 Survey
Questionnaire.

2. Assessing Faculty's Technology needs Survey tool authors: Tena B Crews,
Jessica L miller, Chrisitne M Brown. EQ Volume 32 Number 4 (2009).

Could you please advise me of the process required to gain copyright and author permission?

Thank you
Sincerely

Didy Button
Nurse Academic

----- End forwarded message -----

Appendix 6d Creative commons re Crews et al. 2009

(Use Alt and Left arrow to return)

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http://www.educause.edu/ero/article/assessing-facultys-technology-needs

Level of Assistance Needed to Implement Online Tools

Online Tools	I want to use, but need help (5)	I use, but need new ideas (4)	I use and am comfortable; I do not need help (3)	I don't want to use (2)	I don't know what this is (1)	No Response
Blogs (e-journaling, Blogspot)						
Course management systems (Blackboard, Moodle)						
E-portfolios (through Blackboard, web page)						
Instant messaging (sms)						
Online lectures with audio (PowerPoint)						
Online lectures with video (Breeze, Camtasia)						
Podcasts (video/lecture viewed on computer, iPod)						
Streaming video (web-based video)						
Surveys (Blackboard, Flashlight, Survey Monkey)						
iPod or similar product with audio only						
IPod or similar product with video						
Assigned space for social networking (web page, Breeze meeting, Facebook)						
Wikis (through Blackboard, wikispaces.com)						

Level of Assistance Needed for Utilizing Classroom Tools

Classroom Tools	I want to use, but need help (5)	I use, but need new ideas (4)	I use and am comfortable; I do not need help (3)	I don't want to use (2)	I don't know what this is (1)	No Response
Classroom response systems (iClicker, etc.)						
Document camera (Elmo)						
Electronic whiteboard (Smartboard)						
Interactive pen display (Sympodium)						
Tablet PC						

Helpfulness of Different Types of Training and Support

Type of Support/Training	Extremely Helpful (5)	Helpful (4)	Somewhat Helpful (3)	Not Helpful (2)	I don't know what this is (1)	No Response
Session for department, college, senior campus, regional campus (brainstorming)						
CD-ROM/DVD training (self-paced training)						
Online synchronous meetings (Breeze)						
Online asynchronous meetings (Breeze)						
One-time events (faculty forums by current faculty, experts in the field)						
Series of meetings (community of practice with face-to-face sessions)						
Streaming video (internet-based training)						
Written web resources (information on Center for Teaching Excellence website)						

Appendix 6e Email from Mahdizadeh and Educator Survey

(Use Alt and Left arrow to return)

-----Original Message-----

From: bela0001@flinders.edu.au [mailto:bela0001@flinders.edu.au]

Sent: 27 August 2010 02:55
To: Didy Button Cc: Hossein Mahdizadeh; Biemans, Harm; Ann Harrington; Ingrid Belan
Subject: Re: Thank you of the copy of survey tool

Quoting Didy Button <didy.button@flinders.edu.au>:

Dear Hossein,
Thank you for you response and the attached copy of the Survey Draft. I will have a much closer look at your tool and see if indeed we could work together.

Hossein Mahdizadeh wrote:

Dear Diddy Button,
Thank you for showing your interest in our paper and instrument. You can contact me at Hossein.mahdizadeh@gmail.com or Hossein.mahdizadeh@ilam.ac.ir.
We are also conducting another research in some Iranian medical education with a moderated form of the questionnaire. It would be nice to compare your result with our result from Iran and maybe the Netherlands (If Harm Biemans can arrange that) and publish a joint comparative paper. You can find the items in the SEM model of the paper in my dissertation (if you do not have a copy I can send its digital version for you).As attachment you will find the main questionnaire.
Kind Regards
Hossein

-----Original Message-----

From: Biemans, Harm [mailto:Harm.Biemans@wur.nl]

Sent: Tuesday, August 24, 2010 1:13 PM
To: hossein.mahdizadeh@gmail.com
Cc: didy.button@flinders.edu.au
Subject: FW: Re: Still Seeking permission to access a survey tool used in your research

Dear Hossein,
I received the email below. Will you send Dr. Button a digital version of your survey tool (I do not have it myself)?
Thanks in advance!
Best regards,
Harm

Van: Didy Button [didy.button@flinders.edu.au]
Verzonden: dinsdag 24 augustus 2010 8:06
Aan: Biemans, Harm
CC: ann Harrington; Ingrid Belan
Onderwerp: Re:Still Seeking permission to access a survey tool used in your research
Quoting Didy Button <didy.button@flinders.edu.au>:

Dear Associate Professor Biemans,
I am sorry to bother you again but I have not had any email contact from Mr Hossein Mohdizadeh. Are you in a position to assist me with a copy of the survey tool you and he developed?
Sincerely
Didy Button
Lecturer in Nursing
Flinders University
Adelaide
Australia

Dear Associate Professor Biemans,

This is a matter concerning one of your publications in 2008 in the journal Computers & Education 51 (2008) 142-154. "Determining factors of the use of e-learning environments by university teachers" authors Hossein Mohdizadeh , Harm Biemans and Martin Mulder I recently emailed the lead author Hossein Mohdizadeh seeking Permission to obtain a copy of the survey tool that was used in the research project, however I have not had any response. Could you please advise me if either of Hossein Mohdizadeh 's email address has changed. Or alternatively are you able to email me a copy of the tool. I am currently undertaking my higher degree study examining the issues in e-leaning for Educators and students in Nursing programs in Australia. I would like to see if you survey tool would be suitable to use for the educators in my study. I would of course reference you and the other authors who developed the tool in my work.

Thank you for your consideration in this matter. I will await your response.

Yours sincerely
Didy Button.
Didy Button RN MN FRCNA
Lecturer in Nursing
School of Nursing and Midwifery
Faculty of Health Sciences
Flinders University (Office – W 418)

CCP Clinical Communication Study Aid
http://nursing.flinders.edu.au/students/studyaids/clinicalcommunication/

Phone 08 8201 3312
Mobile 0412 746 123
Fax 08 82761602
Email Didy.button@flinders.edu.au
Postal address GPO Box 2100
Adelaide SA 5001

Mahdizadeh (2008) Educator Survey

Dear Colleagues,

Finding the way to improve the quality of learning is the main goal of many researches and researchers in educational sciences. To do this, researchers in the field, test new methods and technology to increase the effectiveness of learning process. New technology such as Information and Communications Technologies (ICT) are leading to shifts in teaching and learning methods in both distance and traditional education.

There is much interest in applying ICT in education in Wageningen University. Several millions of Euros have been invested in various projects and programs. During the last couple of years chair groups received subsidies for introducing ICT in their courses and many projects were implemented in which ICT was also introduced.

Also in new learning methods, group learning activities such as discussion, co-operation, and collaboration are increasingly emphasised. Online discussion and collaboration, Computer supported collaborative learning (CSCL) are all changing and support the way students learn. They have the capability to combine new learning methods like discussion, co-operation, and collaboration with new high ICT technology.

"**Students' knowledge construction and participation in computer supported collaborative learning in higher education**" is a Ph.D. research which is currently being done in Education and Competence Studies (ECS) group of Social Sciences department. It aims to discover the current situation of collaborative learning, e-learning and online discussion and collaboration in Wageningen University. We hope that the results of this study are useful for both teachers and educational activities in the whole university. For this purpose we need your contribution in giving your attitude about online discussion and collaboration. Your answers to the questions in this questionnaire will be of great benefit in helping us to shape the use of online discussion and collaboration in education, will be kept confidential, and will be used exclusively for ECS research purposes.

Thank you in advance for taking your valuable time to complete this questionnaire.

In this questionnaire you are kindly asked to answer some questions about using face-to-face discussion and collaboration, e-learning, online discussion and collaboration, and CSCL in your course(s).

Definition of concepts used in this questionnaire:

E-learning: In this study e-learning covers applications and processes such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via internet, and Intranet (Network-enabled transfer of skills and knowledge).

CSCW: Computer supported collaborative work environments are seen as tools that permit a group of people to work on a **joint professional task**, including dialogue and social interaction amongst the group members and that allow them to be geographically dispersed.

CSCL: Computer supported collaborative learning environments are seen as tools that permit a group of students to work on a **joint learning task**, including dialogue and social interaction amongst the group members and that allow learners and instructors to be geographically dispersed.

Online discussion: Discussion through the web and internet. In online discussion students discuss about a given topic but in CSCL they are asked to do a joint learning task.

Web-based activity: Activities like navigating and surfing web-sites, reading online articles or books, working with interactive web-sites and etc.

Paper-based activity: Activities like reading books, hard copy of online papers and etc.

1- Please specify your experience in the following activities:

	Yes	No
As a teacher have you ever been actively involved in a course in which E-learning was implemented?		
Do you have any other experiences with E-learning?		
Have you ever been actively involved in a CSCW (computer supported collaborative work) before?		
Do you have any other experiences with CSCW?		
As a teacher have you ever been actively involved in a course in which CSCL (computer supported collaborative learning) was implemented?		
Do you have any other experiences with CSCL?		
As a teacher have you ever been actively involved in a course in which online discussion was implemented?		
Do you have any other experiences with online discussion?		
Do you have a personal web-site or homepage?		
Do you have a web-site or homepage for your courses (in blackboard, quick-place or etc)?		

In your course or courses on average:

Approximately what percentage of your class meeting is devoted to face-to-face discussion/debate/argumentation?

0 –10 ☐ 11- 20 ☐ 21 - 30 ☐ 31 – 40 ☐ 41 – 50 ☐ more than 50 ☐

- Approximately what percentage of your class meeting is devoted to face-to-face co-operative and collaborative teamwork?

0 –10 ☐ 11- 20 ☐ 21 - 30 ☐ 31 – 40 ☐ 41 – 50 ☐ more than 50 ☐

- Approximately what percentage of students' workload in your course is devoted to group and team activities?

0 –10 ☐ 11- 20 ☐ 21 - 30 ☐ 31 – 40 ☐ 41 – 50 ☐ more than 50 ☐

- To what extent do you agree with the following statements?

	strongly disagree	disagree	fairly agree	agree	strongly agree
Learning should be related to real life problems					
Learning should involve social negotiation and mediation					
I think that students should construct their own knowledge through their activities in the course					
Content and skills should be understood within the framework of the learner's prior knowledge					
Students should be encouraged to become self-regulatory, self-mediated, and self-aware					
I think the main role of evaluation in education is to provide students information and feedback about their learning process not for determining a grade.					
Teachers serve primarily as guides and facilitators of learning, not instructors					
Teachers should provide for and encourage multiple perspectives and representations of content					
I am confident using discussion as a learning method					
I think conducting online discussion has added value for students					
I really enjoy using computers instructionally					
I am confident using collaboration and co-operation as a learning method					
Considering the time, content and other features of my course I prefer lecture than discussion					
Considering the time, content and other features of my course I prefer individual tasks (presentation, writing paper, etc) than group tasks					

	strongly disagree	disagree	fairly agree	agree	strongly agree
There is not enough time to incorporate computer and web-based education into the subjects I teach					
I am confident using computer as a learning resource					
I think that the quality of students' learning in my course is improved by using e-learning					
Computer makes my instructional work more difficult					
Using computers for learning takes students away from important instructional time					
Students should reflect on their learning process and learning outcome					
Students learning process should be aimed at the integration of knowledge, attitude, and skill					
I would prefer to learn from a book than from a Web Site					
Well-designed Web sites are easy to learn from					
Using web-sites will increase interaction between teacher and students and students with each other					
Finding your way around a web-site is easier than finding your way around a book					
I think managing a web-site for a course is easy					
I think E-learning education is stimulating					

How important do you rate the use of:

		Not important at all	Less important	Rather important	Very important
1	Computer in education in general?				
2	Internet in education in general?				
3	Discussion in education in general?				
4	Online discussion in education in general?				
5	Cooperative and collaborative teamwork in education in general?				
6	CSCL in education in general				

What are the main advantages of e-learning in your course?

1-

2-

3-

What are the main problems with using e-learning in your course?

1-

2-

3-

In case you use e- learning environments like blackboard, please specify (Tick √) which feature of it do you often use (Tick √ the left column)? And mention to what extent it has added value for your course (if you are not using e-learning any more in your course please go to question number

	The amount of added value for your course				
	Very much	**Very**	**Mildly**	**A little**	**Not at all**
Course calendar and information					
Presenting course materials and literature (through word, pdf, PowerPoint and other kind of documents)					
Announcement					
Mailing list and communicating via email					
Chat					
E-discussion					
Videoconferencing and Net-meeting					
Multi-media					
Specific and specialized web-site					
Specific and specialized software					
Simulation program					
Link (Hypertext)					
Simulation program					
Others(please specify and explain in brief)					

In your opinion to what extent do the following items hinder and prevent using e-learning in your course?

	1 **Very much**	**2** **Very**	**3** **Mildly**	**4** **A little**	**5** **Not at all**
Because e-learning has no added value for my course					
Because I have no time					
Because I could not find an effective and useful software and web-sites for my course					
Because working with e-learning environments and platform is difficult					
Because I think students cannot use it properly					
Because I think e-learning is just useful for distance learning					
Because I think using normal e-mail and search engine like google is enough for my course					
Other(please specify)					

Considering the time, content and other features of your course can you rank out of five following activities based on their effectiveness on students' learning: (1= The most effective activity and 5= the least effective activity)

	Activity	**Rank out of five**
1	Teacher and guests' lecture	
2	Face-to-face discussion	
3	Face-to-face teamwork	
4	Online discussion	
5	CSCL	

If students in your course are required to do a **joint task** co-operatively and collaboratively in small groups:

Can you explain it?

Can you mention /give a typical example of the task?

Do you have any comments concerning using e-learning in Wageningen University?

Do you have any comments concerning using face-to-face, and online discussion and collaboration, in Wageningen University?

Thank you for participating in the study! Please send the completed questionnaire to Education and Competence Studies Group (ECS) internal post box (bode) 68.

Would you like to receive a copy of the result of this survey?

Appendix 6f Student Factor analysis

App. Table 6-10 The Student KMO & Bartlett's test value

The Student KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.822
Bartlett's Test of Sphericity	Approx. Chi-Square	2605.145
	df	66
	Sig.	0.000

Student communalities from PCA extraction are shown in Table 6-11, Student component matrix in Table 6-12 and Student structure matrix in Table 6-13.

App. Table 6-11 Student communalities from PCA extraction

Communalities		
	Initial	**Extraction**
I have high levels of anxiety when using computers (RevCode)	1.000	0.782
I find using ICT difficult (RevCode)	1.000	0.752
E-learning makes studying easier for me	1.000	0.694
It would be good if there was more E-learning	1.000	0.568
E-learning is an important element in my course	1.000	0.659
Without E-learning I would be unable to study	1.000	0.529
E-learning is one of a number of important components	1.000	0.634
E-learning makes my course enjoyable	1.000	0.707
E-learning has increased the flexibility of my university study time	1.000	0.558
I have difficulty finding my way around the university websites (RevCode)	1.000	0.641
I have difficulty finding my way around the library databases (RevCode)	1.000	0.822
I find it difficult to find my way around the library catalogue (RevCode)	1.000	0.733

Extraction Method: Principal Component Analysis.

App. Table 6-12 Component matrix

Component Matrix[a]

	Component		
	1	**2**	**3**
E-learning makes my course enjoyable	.822	-.159	-.075
E-learning makes studying easier for me	.797	-.166	-.178
E-learning has increased the flexibility of my university study time	.732	-.139	.057
E-learning is an important element in my course	.718	-.358	.123
E-learning is one of a number of important components	.699	-.355	.137
It would be good if there was more E-learning	.695	-.155	-.247
Without E-learning I would be unable to study	.577	-.389	.212
I have difficulty finding my way around the library databases (RevCode)	.367	.692	.455
I find it difficult to find my way around the library catalogue (RevCode)	.364	.635	.445
I have difficulty finding my way around the university websites (RevCode)	.474	.609	.214
I find ICT difficult to use(RevCode)	.325	.587	-.550
I have high levels of anxiety when using computers (RevCode)	.419	.566	-.535

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

App. Table 6-13 Structure matrix

Structure Matrix

	Component		
	1	**2**	**3**
E-learning makes my course enjoyable	0.823		
E-learning is an important element in my course	0.801		
E-learning makes studying easier for me	0.799		-0.334
E-learning is one of a number of important components	0.783		
E-learning has increased the flexibility of my university study time	0.735		
It would be good if there was more E-learning	0.698		-0.350
Without E-learning I would be unable to study	0.683		
I have difficulty finding my way around the library databases (RevCode)		0.906	
I find it difficult to find my way around the library catalogue (RevCode)		0.856	
I have difficulty finding my way around the university websites (RevCode)		0.772	-0.395
I have high levels of anxiety when using computers (RevCode)		0.351	-0.876
I find ICT difficult to use(RevCode)		0.318	-0.862

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

App. Table 6-14 Student factor correlation matrix

Factor Correlation Matrix

Factor	**1**	**2**	**3**
1	1.000	0.160	-0.131
2	0.160	1.000	-0.276
3	-0.131	-0.276	1.000

Extraction Method: Principal Component Analysis
Rotation Method: Oblimin with Kaiser Normalization.

Appendix 6g Academic Factor analysis

App. Table 6-15 KMO and Bartlett's test of academic sample adequacy

Academic KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.862
Bartlett's Test of Sphericity	Approx. Chi-Square	1381.813
	df	120
	Sig.	0.000

App. Table 6-16 Academic communalities

Academic Communalities	Initial	Extraction
Confident Using Comp	1.000	0.687
Student learning Improved by E-learning	1.000	0.622
Well-designed websites are easy to learn from	1.000	0.428
E-learning is stimulating	1.000	0.617
Students learn more from web-based activities than paper based	1.000	0.571
E-learning would enhance my effectiveness in teaching	1.000	0.643
E-learning activities are more interesting than paper based activities	1.000	0.701
I am confident using the internet as a learning resource	1.000	0.618
I prefer web-based to paper based activities	1.000	0.647
E-learning increases interaction between teacher/students and student/student	1.000	0.597
No time for ELearning (RevCode)	1.000	0.434
Computer instructions makes work more difficult	1.000	0.565
There is not enough time to develop E-learning resources (RevCode)	1.000	0.520
E-learning has increased my workload (RevCode)	1.000	0.712
I have high anxiety when using computers (RevCode)	1.000	0.581
Considering time I prefer to use E-learning	1.000	0.564

Extraction Method: Principal Component Analysis

App. Table 6-17 Academic goodness of fit test

Goodness-of-fit Test		
Chi-Square	df	Sig.
13781.813	120	0.000

App. Table 6-18 Academic all component PCA pattern matrix component above 0.3

Pattern Matrix[a]			
	Component		
	1	2	3
E-learning activities are more interesting than paper based activities	0.846		
Students learn more from web-based activities than paper based	0.795		
E-learning would enhance my effectiveness in teaching	0.775		
I prefer web-based to paper based activities	0.750		
Student learning Improved by E-learning	0.712		
E-learning is stimulating	0.698		
E-learning increases interaction between teacher/students and student/student	0.679		
Considering time I prefer to use E-learning	0.669		
Well-designed websites are easy to learn from	0.601		
There is not enough time to develop E-learning resources		0.865	
E-learning has increased my workload (RevCode)		0.760	
No time for E-learning (RevCode)		0.747	
Computer instructions work more difficult (RevCode)		0.482	
Confident Using Comp			0.817
I am confident using the internet as a learning resource			0.791
I have high anxiety when using computers (RevCode)			0.751

Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization. a. Rotation converged in 5 iterations

App. Table 6-19 Academic factor correlation matrix

Academic Factor Correlation Matrix			
Factor	1	2	3
1	1.000	0.244	0.252
2	0.244	1.000	0.189
3	0.252	0.189	1.000

Extraction Method: Principal[al Component Analysis

Rotation Method: Oblimin with Kaiser Normalization.

Appendix 6h Nursing student E-learning questionnaire

Nursing Student Computer use survey

1. Student Survey Introduction

Thank you for accessing this survey, which is being conducted in all Schools of Nursing and Midwifery in Australia. Before proceeding please read the following information regarding the purpose and use of this survey:

• Your Dean or Head of School as given permission for this survey to be emailed to all preregistration Nursing and Midwifery students.

• All responses are CONFIDENTIAL.

• Your name and the name of your University will NOT be used in the thesis or any publication that results from this research.

• Your Dean or Head of School will NOT receive any of your responses.

• The results from this survey will assist in the development of a Computer/Information literacy curriculum for Schools of Nursing and Midwifery in Australia.

• Your responses will assist in shaping the future of nursing and midwifery in Australia.

Page 1

Nursing Student Computer use survey

2.

1. What is your current status as a student?

- ○ First year
- ○ Second year
- ○ Third year
- ○ Graduate entry

2. What is your major area of study?

- ○ Nursing
- ○ Midwifery

3. What is you age?

____

4. Please indicate your Gender:

- ○ Female
- ○ Male

5. Your current status as a student is:

- ○ Full time
- ○ Part time.

6. What is the name of your University where you are enrolled?

____

7. What is the postcode of area where you are now living?

____

Nursing Student Computer use survey

3.

1. Is English your first language?

- ◯ Yes
- ◯ No

2. Approximately how old is your personal desktop computer?

- ◯ Don't own a desktop computer
- ◯ Less than 1 year old
- ◯ 1 year old
- ◯ 2 years old
- ◯ 3 years old
- ◯ 4 years old
- ◯ More than 4 years old.

3. Approximately how old is your personal laptop computer?

- ◯ Don't own a laptop computer
- ◯ Less than 1 year old
- ◯ 1 year old
- ◯ 2 years old
- ◯ 3 years old
- ◯ 4 years old
- ◯ More than 4 years old

4. Approximately how many hours each week do you spend actively doing Internet activities for university, work, or recreation?

Nursing Student Computer use survey

4.

1. Do you use your computer to:

	Yes	No
Communicate with other students	○	○
Communicate with family/friends	○	○
Communicate with tutors/teachers	○	○
Doing a learning task collaboratively	○	○
Doing a learning task individually	○	○
Gathering information	○	○
Listening to course material	○	○
Managing information	○	○
Oral presentation	○	○
Planning a group learning task	○	○
Planning a individual learning task	○	○
Reading course material	○	○
Revising for an exam	○	○
Self assessment exercises	○	○
Viewing course material	○	○
Writing an assignment	○	○
Writing a PowerPoint presentation	○	○
Recording data in a spreadsheet eg Excel	○	○

Nursing Student Computer use survey

5.

Please indicate your level of agreement with each of the following statements.

1. By e-learning I mean the use of any kind of Internet or communication service or electronic device that supports you in a learning activity.

	Disagree Strongly	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Agree Strongly	Not Applicable
Getting access to an Internet connected computer is a problem for me.	○	○	○	○	○	○	○	○
E-Learning makes studying easier for me.	○	○	○	○	○	○	○	○
It would be good if there was much more E-learning in my courses.	○	○	○	○	○	○	○	○
I find it difficulty finding my way around the University web sites.	○	○	○	○	○	○	○	○
I find it difficulty finding my way around the Library databases.	○	○	○	○	○	○	○	○
Using the online mail and discussions I feel connected to the other students at Uni.	○	○	○	○	○	○	○	○
I find it frustrating that my IT devices are not compatible with the university devices.	○	○	○	○	○	○	○	○
Using email is the easiest way to contact my teachers about course related information.	○	○	○	○	○	○	○	○

Appendix 6h: Nursing student E-learning questionnaire

Nursing Student Computer use survey

6.

1. By e-learning I mean the use of any kind of Internet or communication service or electronic device that supports you in a learning activity.

	Disagree Strongly	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Agree Strongly	Not Applicable
E-Learning is an important element of my course.	○	○	○	○	○	○	○	○
Without e-learning I would be unable to study.	○	○	○	○	○	○	○	○
E-Learning is one of a number of important components of my course.	○	○	○	○	○	○	○	○
E-Learning makes my course more enjoyable.	○	○	○	○	○	○	○	○
I have a high level of anxiety when using computers.	○	○	○	○	○	○	○	○
When I started at university they provided courses so that I was prepared to use the computers in my course.	○	○	○	○	○	○	○	○
With E-learning I interact more with other students.	○	○	○	○	○	○	○	○
I find using computers frustrating.	○	○	○	○	○	○	○	○
I find using technological devices difficult (eg. Computer, Personal digital assistant (Pda)/mobile phone/mp3 player).	○	○	○	○	○	○	○	○

Appendix 6h: Nursing student E-learning questionnaire

Nursing Student Computer use survey

7.

1. By e-learning I mean the use of any kind of Internet or communication service or electronic device that supports you in a learning activity.

	Disagree Strongly	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Someagree	Agree	Agree Strongly	Not Applicable
Plagiarism and academic dishonesty is more common because of online assessments.	◯	◯	◯	◯	◯	◯	◯	◯
E-learning has increased the flexibility of my university study time.	◯	◯	◯	◯	◯	◯	◯	◯
As student nurse/midwives we should be taught about the computer programs being used out in the field.	◯	◯	◯	◯	◯	◯	◯	◯
When searching for information for my assignments I first go to Wikipedia.	◯	◯	◯	◯	◯	◯	◯	◯
I would find it easier to do my studies if I knew more about using computers.	◯	◯	◯	◯	◯	◯	◯	◯
As a registered nurse/midwife I will use computers everyday in my job.	◯	◯	◯	◯	◯	◯	◯	◯
"Information literacy" is best described as the ability to locate, evaluate, and use information effectively.	◯	◯	◯	◯	◯	◯	◯	◯

Appendix 6h: Nursing student E-learning questionnaire

Nursing Student Computer use survey

8.

1. By e-learning I mean the use of any kind of Internet or communication service or electronic device that supports you in a learning activity.

	Disagree Strongly	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Someagree	Agree	Agree Strongly	Not Applicable
The university software is out of date.	○	○	○	○	○	○	○	○
Online submission of my assignments is a simple process.	○	○	○	○	○	○	○	○
I find it difficulty to find my way around the library catalogue.	○	○	○	○	○	○	○	○
The discussion forums in each subject or topic or unit are a useful source of information for my studies.	○	○	○	○	○	○	○	○
I read the discussion forums but I choose not to contribute to the forum.	○	○	○	○	○	○	○	○
When on campus I find it difficult to find a computer with online access.	○	○	○	○	○	○	○	○
The classrooms where I have my classes are not equipped with Information technology devices. Eg Computer and projector and access to the web.	○	○	○	○	○	○	○	○
I can listen to my lectures with my MP3 player so I do not attend lectures on campus.	○	○	○	○	○	○	○	○

Appendix 6h: Nursing student E-learning questionnaire

Nursing Student Computer use survey

9.

The following series of questions relate to how you find information when you are writing your assignments.

1. How would you refine(narrow) your subject/topic for an assignment?

- ◯ Ask a teacher to help narrow your topic.
- ◯ Use a computer database for journal articles and look for key words in the title.
- ◯ Read an encyclopedic article and look for the subtopics.
- ◯ All of the above.
- ◯ Don't know

2. What is the best way to truncate the word ECONOMICS in order to get the variant words: economically, econometrics, economy?

- ◯ Economic*
- ◯ Ec*
- ◯ Econom*
- ◯ Eco*
- ◯ Don't know

3. The difference between a full text database and a citation database is:

- ◯ A full-text database includes articles some of which are full text. The citation database includes bibliographic information about the articles.
- ◯ The full-text database includes an abstract for each article. The citation database does not include an abstract for each article.
- ◯ The full-text database does not include citations.
- ◯ The citation database includes abstracts for each article.
- ◯ Don't know

4. Which of these keyword searches should retrieve the most results in an online database?

- ◯ Dyslexia OR learning disorders
- ◯ Dyslexia AND learning disorders
- ◯ Dyslexia NOT learning disorders
- ◯ Dyslexia
- ◯ Don't know

Nursing Student Computer use survey

5. A KEYWORD search will:

- ◯ search only titles.
- ◯ work even if you spell a word wrong.
- ◯ search title, contents, and subject areas.
- ◯ search reference material only.
- ◯ Don't know

6. All of the following are good tips for KEYWORD searching EXCEPT:

- ◯ Limit your keyword search entry to just a few words.
- ◯ Use very broad, general terms (i.e. animals).
- ◯ Check your search words for mistyped or misspelled words.
- ◯ Use wildcard symbols to find both singular and plural.
- ◯ Don't know

10.

1. You should include references in your assignment because:

- references allow you to locate and read the sources yourself.
- references give credit to authors.
- references allow readers to determine the credibility of your sources.
- all of the above.
- Don't know.

2. When using information from a Web site for your assignment, an essential question to ask yourself is:

- "Can I order products from this site?"
- "Are these pictures/graphs/charts colorful enough?"
- "Is all the spelling and grammar correct in this text?"
- "Who is the author of this information and is it accurate?"
- Don't know.

3. Information that you find on the Internet:

- is far more reliable than books and magazines.
- is factual because the Internet is constantly monitored by world educational organizations.
- is required by law to be accurate, timely, and appropriate.
- comes from many varied sources such as business, the government, or private citizens.
- Don't know.

4. An example of a biased Web site would be:

- a drug company promoting a particular drug.
- a national news site giving weather reports.
- a college library allowing access to its reference material.
- an airline listing future flights for advance reservations.
- Don't know.

Nursing Student Computer use survey

5. What does “13” in the citation below signify?

Ahern, N. (2005). "Using the internet to conduct research." Nurse Researcher 13(2): 55-70.

- ◯ total number of pages
- ◯ number of references
- ◯ volume number of periodical
- ◯ beginning page of article
- ◯ Don't know

6. If you decide to use information from a Web site for your research project you:

- ◯ only have to cite text sources.
- ◯ can assume that all of the data or text is copyrighted.
- ◯ may use the text graphics freely unless they are specifically labeled as being copyrighted.
- ◯ do not have to give credit to your sources since information on the Web is not copyright protected.
- ◯ Don't know.

Nursing Student Computer use survey

11.

1. List any suggestions to help the university understand your needs to enhance your learning.

2. List any challenges you face in your learning.

Appendix 6h: Nursing student E-learning questionnaire

Appendix 6i Nurse academic E-learning questionnaire

Academic E-learning survey

1.

Thank you for accessing this survey, which is being conducted in all Schools of Nursing and Midwifery in Australia. Before proceeding please read the following information regarding the purpose and use of this survey:

• Your Dean or Head of School as given permission for this survey to be emailed to all teaching staff involved in pre-registration Nursing and Midwifery programs. The survey is being emailed nationally.

• Your Dean or Head of School will NOT receive any of your responses.

• All responses are CONFIDENTIAL.

• Your name and the name of your University will NOT be used in the thesis or any publication that results from this research.

• The results from this survey will assist
in the development of a Computer/Information literacy curriculum for Australian Schools of Nursing and Midwifery.

Academic E-learning survey

2.

Please answer the following questions:

1. What is your current status as a University teacher?

- ◯ Fulltime academic
- ◯ Part time academic
- ◯ Part time sessional teacher (PTT)
- ◯ Fulltime teaching only position

2. What is the name of the University where you are employed?

3. Approximately how many years have you been employed as a University teacher?

4. What is your major area of teaching?

- ◯ Nursing
- ◯ Midwifery

5. Please indicate your gender:

- ◯ Female
- ◯ Male

Appendix 6i: Nurse academic E-learning questionnaire

Academic E-learning survey

3.

6. Approximately how old is your personal desktop computer?

- ◯ Don't own a desktop computer
- ◯ Less than 1 year old
- ◯ 1 year old
- ◯ 2 years old
- ◯ 3 years old
- ◯ 4 years old
- ◯ More than 4 years old

7. Approximately how old is your personal laptop computer?

- ◯ Don't own a desktop computer
- ◯ Less than 1 year old
- ◯ 1 year old
- ◯ 2 years old
- ◯ 3 years old
- ◯ 4 years old
- ◯ More than 4 years old

8. Approximately how many hours each week do you spend actively doing Internet activities for work, or recreation?

Academic E-learning survey

4.

9. Please answer Yes or No to the statements below that apply to you and how you use computer/information technology.

	Yes	No
Communicate with family/friends	○	○
Communicate with academics/teachers	○	○
Doing a learning task collaboratively	○	○
Doing a learning task individually	○	○
Gathering information	○	○
Developing course material	○	○
Managing information	○	○
Oral presentation	○	○
Planning a group learning task	○	○
Planning a individual learning task	○	○
Writing course material	○	○
Developing a written assessment	○	○
Writing an exam	○	○
Monitoring discussion forums online	○	○
Updating course material	○	○
Writing a PowerPoint presentation	○	○
Recording data in a spreadsheet eg Excel	○	○
Entering data into a grade management system	○	○
Programing high fidelity simulation	○	○
Programing computer simulation	○	○

Appendix 6i: Nurse academic E-learning questionnaire

5.

10. By E-learning I mean the use of any kind of communication service or electronic device that supports you in your work activity, including intranet and the internet.

To what extent do you agree with the following statements?

	Disagree Strongly	Disagree	Somewhat Disagree	Neither Disagree or Agree	Somewhat Agree	Agree	Agree Strongly
There is not enough time to incorporate computer and web-based education into the subjects I teach	○	○	○	○	○	○	○
I am confident using computer as a learning resource	○	○	○	○	○	○	○
I think that the quality of students' learning in my course is improved by using e-learning	○	○	○	○	○	○	○
Computers makes my instructional work more difficult	○	○	○	○	○	○	○
Using computers for learning takes students away from important instructional time	○	○	○	○	○	○	○
Students learning process should be aimed at the integration of knowledge, attitude, and skill	○	○	○	○	○	○	○
There is not enough time to develop e-learning resources	○	○	○	○	○	○	○
I would prefer to learn from a book than from a Web Site	○	○	○	○	○	○	○
Well-designed Web sites are easy to learn from	○	○	○	○	○	○	○
I think managing a web-site for a course is easy	○	○	○	○	○	○	○
I think E-learning education is stimulating	○	○	○	○	○	○	○

Appendix 6i: Nurse academic E-learning questionnaire

Academic E-learning survey

6.

11. By E-learning I mean the use of any kind of communication service or electronic device that supports you in your work activity, including intranet and the internet.

To what extent do you agree with the following statements?

	Disagree Strongly	Disagree	Somewhat Disagree	Neither Disagree or Agree	Somewhat Agree	Agree	Agree Strongly
E-learning has increased my workload							
I think students learn more using web assisted activities than paper assisted activities							
I think using the e-learning technology (i.e., Blackboard) would enhance my effectiveness in teaching							
I think web assisted activities are more interesting and comfortable than the paper assisted activity							
The computer technology at my university is out dated.							
Considering the time I prefer to use e-learning in my course							
I am confident using Internet as a learning resource							
Marking online is difficult for me							
I prefer the web assisted activities instead of the paper assisted activities because it has sound, animation, link (hypertext), different colors etc							
Using web-sites will increase interaction between teacher and students and students with each other							
I get frustrated with the incompatibilities of software and hardware							
Finding your way around a web-site is easier than finding your way around a book							
I have a high level of anxiety when using computers							

Appendix 6i: Nurse academic E-learning questionnaire

Academic E-learning survey

7.

12. Please indicate the level of assistance required and willingness to use the various types of technology. You may select more than one answer per question if required.

	I want to use but need help with.	I use, but need new ideas.	I use and am comfortable;	I do not need help.	I know what this is but I don't want to use it.	I don't want to use.	I don't know what this is.	This technology is not available at my University.
Blogs (e-journaling, Blogspot)	☐	☐	☐	☐	☐	☐	☐	☐
Course management systems (Blackboard, Moodle)	☐	☐	☐	☐	☐	☐	☐	☐
E-portfolios (through Blackboard, web page)	☐	☐	☐	☐	☐	☐	☐	☐
Instant messaging (MSN) Facebook	☐	☐	☐	☐	☐	☐	☐	☐
Online lectures with audio (PowerPoint)	☐	☐	☐	☐	☐	☐	☐	☐
Online lectures with video (WebCT Breeze, Camtasia)	☐	☐	☐	☐	☐	☐	☐	☐
Podcasts (video/lecture viewed on computer, iPod)	☐	☐	☐	☐	☐	☐	☐	☐
Streaming video (web-based video)	☐	☐	☐	☐	☐	☐	☐	☐
Surveys (Blackboard, Flashlight, Survey Monkey)	☐	☐	☐	☐	☐	☐	☐	☐
iPod or similar product with audio only	☐	☐	☐	☐	☐	☐	☐	☐
IPod or similar product with video	☐	☐	☐	☐	☐	☐	☐	☐

Academic E-learning survey

8.

13. Please indicate the level of assistance required and willingness to use the various types of technology. You may select more than one answer per question if required.

	I want to use but need help with.	I use, but need new ideas.	I use and am comfortable;	I do not need help.	I know what this is but I don't want to use it.	I don't want to use.	I don't know what this is.	This technology is not available at my University.
Assigned space for social networking (web page, Breeze meeting, Facebook)								
Wikis (through Blackboard, wikispaces.com)								
Classroom response systems (iClicker, etc.)								
Document camera (Elmo)								
Electronic whiteboard (Smartboard)								
Interactive pen display (Sympodium)								
Tablet PC								
Database (Access)								
E-mail (Outlook)								
Presentation(PowerPoint)								
Screen/voice capture (Camtasia,Captivate,Jing)								

Appendix 6i: Nurse academic E-learning questionnaire

9.

14. Please indicate the level of assistance required and willingness to use the various types of technology. You may select more than one answer per question if required.

	I want to use but need help with.	I use, but need new ideas.	I use and am comfortable;	I do not need help.	I know what this is but I don't want to use it.	I don't want to use.	I don't know what this is.	This technology is not available at my University.
Spreadsheet (Excel)	☐	☐	☐	☐	☐	☐	☐	☐
Web page design (Dreamweaver)	☐	☐	☐	☐	☐	☐	☐	☐
Word processing (Word)	☐	☐	☐	☐	☐	☐	☐	☐
Personal digital assistant for patient data entry(PDA)	☐	☐	☐	☐	☐	☐	☐	☐
High fidelity simulation (Simman)	☐	☐	☐	☐	☐	☐	☐	☐
Computer programmable manikins (Nursing Anne)	☐	☐	☐	☐	☐	☐	☐	☐
Advanced Life Support Manikins with computer read out (Resusci Anne)	☐	☐	☐	☐	☐	☐	☐	☐
ECG trainer	☐	☐	☐	☐	☐	☐	☐	☐
Computer programmable training devices	☐	☐	☐	☐	☐	☐	☐	☐
IV pumps	☐	☐	☐	☐	☐	☐	☐	☐
Self-directed computer based patient scenarios (Vital sim)	☐	☐	☐	☐	☐	☐	☐	☐

Academic E-learning survey

10.

The following questions are about the usefulness of different ways of delivering training and support (staff development).

15. Does your University offer the following ways of receiving staff development about computer/information technology?

	Yes	No
Session for department, college, senior campus, regional campus (brainstorming)	☐	☐
CD-ROM/DVD training (self-paced training)	☐	☐
Online synchronous meetings (Breeze)	☐	☐
Online asynchronous meetings (Breeze)	☐	☐
One-time events (faculty forums by current faculty, experts in the field)	☐	☐
Series of meetings (community of practice with face-to-face sessions)	☐	☐
Streaming video (Internet-based training)	☐	☐
Written web resources (information on University website)	☐	☐

Academic E-learning surveyy

11.

16. How useful to you are the following ways of receiving staff development about computer/information technology?

	Extremely Helpful.	Helpful.	Somewhat Helpful.	Not Helpful.	I don't know what this is.
Session for department, college, senior campus, regional campus (brainstorming)	☐	☐	☐	☐	☐
CD-ROM/DVD training (self-paced training)	☐	☐	☐	☐	☐
Online synchronous meetings (Breeze)	☐	☐	☐	☐	☐
Online asynchronous meetings (Breeze)	☐	☐	☐	☐	☐
One-time events (faculty forums by current faculty, experts in the field)	☐	☐	☐	☐	☐
Series of meetings (community of practice with face-to-face sessions)	☐	☐	☐	☐	☐
Streaming video (Internet-based training)	☐	☐	☐	☐	☐
Written web resources (information on University website)	☐	☐	☐	☐	☐

Appendix 6i: Nurse academic E-learning questionnaire

Academic E-learning survey

12.

17. In your opinion which of the following ways of receiving staff development about computer/information technology could be most helpful to you?

	Extremely Helpful.	Helpful.	Somewhat Helpful.	Not Helpful.	I don't know what this is.
Session for department, college, senior campus, regional campus (brainstorming)	☐	☐	☐	☐	☐
CD-ROM/DVD training (self-paced training)	☐	☐	☐	☐	☐
Online synchronous meetings (Breeze)	☐	☐	☐	☐	☐
Online asynchronous meetings (Breeze)	☐	☐	☐	☐	☐
One-time events (faculty forums by current faculty, experts in the field)	☐	☐	☐	☐	☐
Series of meetings (community of practice with face-to-face sessions)	☐	☐	☐	☐	☐
Streaming video (Internet-based training)	☐	☐	☐	☐	☐
Written web resources (information on University website)	☐	☐	☐	☐	☐

Appendix 6i: Nurse academic E-learning questionnaire

13.

18. List any suggestions to help the university understand your needs to enhance your teaching

19. List any challenges you face in your teaching

Appendix 6j Index of Relative Socio-Economic Disadvantage

The Australian Bureau of Statistics (ABS) derived information from the 2011 Census to produce Socio-Economic Indexes for Areas (SEIFA). The ABS then developed four indexes:

- Index of Relative Socio-Economic Disadvantage (IRSD)
- Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD)
- Index of Economic Resources (IER)
- Index of Education and Occupation (IEO)

to allow ranking of regions there by providing a method of determining the level of social and economic well-being in each region (Australian Bureau of Statistics 2013). The researcher selected the IRSD as being most relevant to this study. In the IRSD each variable has a calculated loading that indicates the correlation of that variable with the index. A negative loading indicates a disadvantaging variable. All variables in this index are indicators of disadvantage. INC_LOW is the strongest indicator of disadvantage (Australian Bureau of Statistics 2013).

IRSD weighted values (Australian Bureau of Statistics 2013)

ENGLISHPOOR	%of people who do not speak English well	-0.34
NOEDU	% of people aged 15 years and over who have no educational attainment	-0.44
OCC_SERVICE_L	% of employed people classified as low skill Community and Personal Service workers	-0.50
OCC_DRIVERS	% of employed people classified as Machinery Operators and Drivers	-0.52
OVERCROWD	% of occupied private dwellings requiring one or more extra bedrooms	-0.52
SEP_DIVORCED	% of people aged 15 years and over who are separated or divorced	-0.54
NOCAR	% of occupied private dwellings with no cars	-0.56
DISABILITYU70	% of people under the age of 70 who have a long-term health condition or disability and need assistance with core activities	-0.66
ONEPARENT	% of one parent families with dependent offspring only	-0.71
LOWRENT	% of occupied private dwellings paying rent less than $166 per week (excluding $0 per week)	-0.73
UNEMPLOYED	% of people (in the labour force) who are unemployed	-0.74
NOYEAR12ORHIGHER	% of people aged 15 years and over whose highest level of education is Year 11 or lower	-0.75
OCC_LABOUR	% of employed people classified	-0.75

	as Labourers	
NONET	% of occupied private dwellings with no internet connection	-0.81
CHILDJOBLESS	% of families with children under 15 years of age who live with jobless parents	-0.85
INC_LOW	% of people with stated household equivalised income between $1 and $20,799 per year	-0.90

Index of Relative Social Disadvantage representing postcodes

IRSD	Frequency	Percent	Cumulative Percent
818	1	0.2	0.2
831	1	0.2	0.4
852	3	0.6	1.1
862	1	0.2	1.3
875	1	0.2	1.5
880	3	0.6	2.1
884	1	.2	2.4
893	2	0.4	2.8
894	1	0.2	3.0
899	1	0.2	3.2
901	2	0.4	3.6
904	2	0.4	4.1
910	3	0.6	4.7
912	1	0.2	4.9
913	4	0.9	5.8
915	3	0.6	6.4
916	1	0.2	6.7
917	1	0.2	6.9
922	1	0.2	7.1
924	4	0.9	7.9
926	1	0.2	8.2
930	2	0.4	8.6
932	1	0.2	8.8
935	16	3.4	12.2
937	2	0.4	12.7
938	1	0.2	12.9
939	3	0.6	13.5
941	2	0.4	13.9
942	2	0.4	14.4
945	2	0.4	14.8
946	1	0.2	15.0
949	1	0.2	15.2
950	2	0.4	15.7

951	2	0.4	16.1
952	6	1.3	17.4
953	1	0.2	17.6
954	7	1.5	19.1
955	1	0.2	19.3
956	1	0.2	19.5
960	3	0.6	20.2
961	8	1.7	21.9
962	1	0.2	22.1
963	1	0.2	22.3
964	5	1.1	23.4
965	3	0.6	24.0
966	1	0.2	24.2
967	7	1.5	25.8
969	5	1.1	26.8
970	1	0.2	27.0
971	5	1.1	28.1
972	2	0.4	28.5
973	3	0.6	29.2
974	7	1.5	30.7
975	11	2.4	33.0
976	2	0.4	33.5
977	1	0.2	33.7
978	2	0.4	34.1
980	3	0.6	34.8
981	1	0.2	35.0
983	6	1.3	36.3
984	3	0.6	36.9
985	1	0.2	37.1
986	2	0.4	37.6
987	17	3.6	41.2
988	1	0.2	41.4
990	2	0.4	41.8
991	25	5.4	47.2
992	1	0.2	47.4
993	1	0.2	47.6

IRSD	Frequency	Percent	Cumulative Percent
994	6	1.3	48.9
995	14	3.0	51.9
996	9	1.9	53.9
997	1	0.2	54.1
998	4	0.9	54.9
999	5	1.1	56.0
1000	5	1.1	57.1
1001	1	0.2	57.3
1002	1	0.2	57.5
1003	7	1.5	59.0
1004	5	1.1	60.1
1005	1	0.2	60.3
1006	4	0.9	61.2
1007	2	0.4	61.6
1008	1	0.2	61.8
1009	1	0.2	62.0
1010	3	0.6	62.7
1011	1	0.2	62.9
1012	2	0.4	63.3
1013	2	0.4	63.7
1015	1	0.2	63.9
1016	2	0.4	64.4
1017	3	0.6	65.0
1018	6	1.3	66.3
1019	3	0.6	67.0
1020	8	1.7	68.7
1021	1	0.2	68.9
1022	4	0.9	69.7
1023	4	0.9	70.6
1025	2	0.4	71.0
1026	1	0.2	71.2
1027	2	0.4	71.7
1028	1	0.2	71.9

1029	5	1.1	73.0
1030	2	0.4	73.4
1032	1	0.2	73.6
1033	7	1.5	75.1
1034	6	1.3	76.4
1036	3	0.6	77.0
1037	2	0.4	77.5
1038	1	0.2	77.7
1040	2	0.4	78.1
1041	2	0.4	78.5
1043	3	0.6	79.2
1045	1	0.2	79.4
1046	4	0.9	80.3
1047	3	0.6	80.9
1051	6	1.3	82.2
1052	2	0.4	82.6
1055	2	0.4	83.0
1057	4	0.9	83.9
1058	2	0.4	84.3
1059	4	0.9	85.2
1060	2	0.4	85.6
1064	2	0.4	86.1
1065	2	0.4	86.5
1066	1	0.2	86.7
1067	5	1.1	87.8
1068	1	0.2	88.0
1069	4	0.9	88.8
1070	2	0.4	89.3
1071	2	0.4	89.7
1073	1	0.2	89.9
1074	1	0.2	90.1
1075	4	0.9	91.0
1077	1	0.2	91.2
1078	2	0.4	91.6
1080	4	0.9	92.5
1081	4	0.9	93.3

1082	1	0.2	93.6
1083	4	0.9	94.4
1084	1	0.2	94.6
1085	1	0.2	94.8
1088	2	0.4	95.3
1091	3	0.6	95.9
1093	1	0.2	96.1
1095	1	0.2	96.4
1096	2	0.4	96.8
1098	1	0.2	97.0
1101	3	0.6	97.6
1102	1	0.2	97.9
1103	1	0.2	98.1
1105	1	0.2	98.3
1106	3	0.6	98.9
1109	4	0.9	99.8
1119	1	0.2	100.0
Total	466	100.0	

Appendix 7a Spread of age across the student respondents

(Use the Alt and Left arrow keys to return to previous location in thesis. *Please use these hot keys for all appendices' navigation)

App. Table 7-50 Student age frequency

Age	Frequency	%
17	6	1.3
18	27	5.8
19	44	9.4
20	34	7.3
21	40	8.6
22	19	4.1
23	16	3.4
24	20	4.3
25	8	1.7
26	9	1.9
27	7	1.5
28	15	3.2
29	11	2.4
30	15	3.2
31	7	1.5
32	9	1.9
33	14	3.0
34	6	1.3
35	13	2.8
36	7	1.5
37	9	1.9
38	11	2.4
39	11	2.4
40	4	.9
41	7	1.5
42	13	2.8
43	4	.9
44	8	1.7
45	9	1.9
46	7	1.5
47	7	1.5
48	5	1.1
49	10	2.1
50	12	2.6

51	2	.4
52	2	.4
53	4	.9
54	2	.4
55	2	.4
56	1	.2
57	1	.2
58	2	.4
59	4	.9
61	1	.2
62	1	.2
Total	**466**	**100.0**

Appendix 7b DSS Scale results for age and ESL

App. Table 7-51 Students 25 years and under DSS results, n=214

Question	Correct answer:	Correct n (%)	Incorrect n (%)
How would you refine (narrow) your subject/topic for an assignment?	All of the options Ask teacher Use computer database for articles Read an encyclopaedic article	2 (0.9)	212 (99.1)
What is the best way to truncate the word ECONOMICS in order to get the variant words: economically, econometrics, economy?	Econom*	24 (11.2)	190 (88.8)
The difference between a full text database and a citation database is:	A full text database includes some full text articles. The citation database includes bibliographic information about the article	15 (7)	199 (93)
Which of these keyword searches should retrieve the most results in an online database?	Dyslexia AND learning disorders	101 (47.2)	113 (52.8)
A KEYWORD search will:	Search title, contents, and subject areas	175 (81.8)	39 (18.2)
All of the following are good tips for KEYWORD searching EXCEPT:	Use very broad, general terms (i.e. animals)	95 (44.4)	119 (55.6)
You should include references in your assignment because:	All of the options References allow you to locate and read the sources yourself References give credit to authors References allow readers to determine the credibility of your sources	24 (11.2)	190 (88.8)
When using information from a Website for your assignment, an essential question to ask yourself is:	Who is the author of this info and is it accurate?	211 (98.6)	3 (1.4)
Information that you find on the internet	Comes from many varied sources such as business, the government, or private citizens	196 (91.6)	18 (8.4)

Table 7-51 continued

Question	Correct answer:	Correct n (%)	Incorrect n (%)
An example of a biased Website would be:	A drug company promoting a particular drug	175 (81.8)	39 (18.2)
What does ‘13’ in the citation below signify? Ahern, N. (2005) Using the internet to conduct research Nurse Researcher 13 (2);55-70	Volume number of periodical	190 (88.8)	24 (11.2)
If you decide to use information from a Website for your research project you:	Can assume that all of the data or text is copyright	113 (52.8)	101 (47.2)

App. Table 7-52 Students over 25 years of age DSS results, n=252

Question	Correct answer:	Correct n (%)	Incorrect n (%)
How would you refine (narrow) your subject/topic for an assignment?	All of the options Ask teacher Use computer database for articles Read an encyclopaedic article	4 (1.4)	248 (98.4)
What is the best way to truncate the word ECONOMICS in order to get the variant words: economically, econometrics, economy?	Econom*	12 (4.8)	248 (95.2)
The difference between a full text database and a citation database is:	A full text database includes some full text articles. The citation database includes bibliographic information about the article	16 (6.3)	236 (39.7)
Which of these keyword searches should retrieve the most results in an online database?	Dyslexia AND learning disorders	152 (60.3)	100 (39.7)
A KEYWORD search will:	Search title, contents, and subject areas	206 (81.7)	46 (18.3)
All of the following are good tips for KEYWORD searching EXCEPT:	Use very broad, general terms (i.e. animals)	126 (50)	126 (50)
You should include references in your assignment because:	All of the options References allow you to locate and read the sources yourself References give credit to authors References allow readers to determine the credibility of your sources	40 (15.9)	212 (84.1)
When using information from a Website for your assignment, an essential question to ask yourself is:	Who is the author of this info and is it accurate?	246 (97.6)	6 (2.4)
Information that you find on the internet	Comes from many varied sources such as business, the government, or private citizens	239 (94.8)	13 (5.2)
An example of a biased Website would be:	A drug company promoting a particular drug	216 (85.7)	36 (14.3)
What does '13' in the citation below signify? Ahern, N. (2005) Using the internet to conduct research Nurse Researcher 13 (2);55-70	Volume number of periodical	231 (91.7)	21 (8.3)
If you decide to use information from a Website for your research project you:	Can assume that all of the data or text is copyright	129 (51.2)	123 (48.8)

App. Table 7-53 Students with ESL DSS results, n=43

Question	Correct answer:	Correct n (%)	Incorrect n (%)
How would you refine (narrow) your subject/topic for an assignment?	All of the options Ask teacher Use computer database for articles Read an encyclopaedic article	0	43 (100)
What is the best way to truncate the word ECONOMICS in order to get the variant words: economically, econometrics, economy?	Econom*	3 (7)	40 (93)
The difference between a full text database and a citation database is:	A full text database includes some full text articles. The citation database includes bibliographic information about the article	3 (7)	40 (93)
Which of these keyword searches should retrieve the most results in an online database?	Dyslexia AND learning disorders	17 (39.5)	26 (60.5)
A KEYWORD search will:	Search title, contents, and subject areas	39 (90.70	4 (9.3)
All of the following are good tips for KEYWORD searching EXCEPT:	Use very broad, general terms (i.e. animals)	20 (46.5)	23 (53.5)
You should include references in your assignment because:	All of the options References allow you to locate and read the sources yourself References give credit to authors References allow readers to determine the credibility of your sources	10 (23.3)	33 (76.7)
When using information from a Website for your assignment, an essential question to ask yourself is:	Who is the author of this info and is it accurate?	42 (97.7)	1 (2.3)

Table 7-53 continued

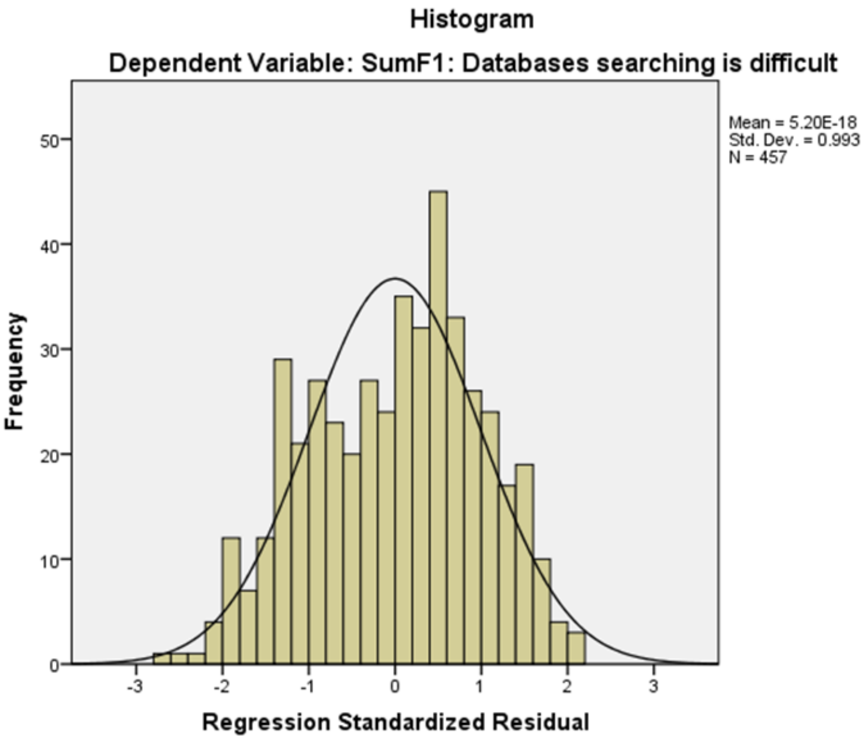
Question	Correct answer:	Correct n (%)	Incorrect n (%)
Information that you find on the internet	Comes from many varied sources such as business, the government, or private citizens	36 (83.7)	7 (16.3)
An example of a biased Website would be:	A drug company promoting a particular drug	29 (67.4)	14 (32.6)
What does ‘13’ in the citation below signify? Ahern, N. (2005) Using the internet to conduct research Nurse Researcher 13 (2);55-70	Volume number of periodical	37 (86)	6 (14)
If you decide to use information from a Website for your research project you:	Can assume that all of the data or text is copyright	21 (48.8)	22 (51.2)

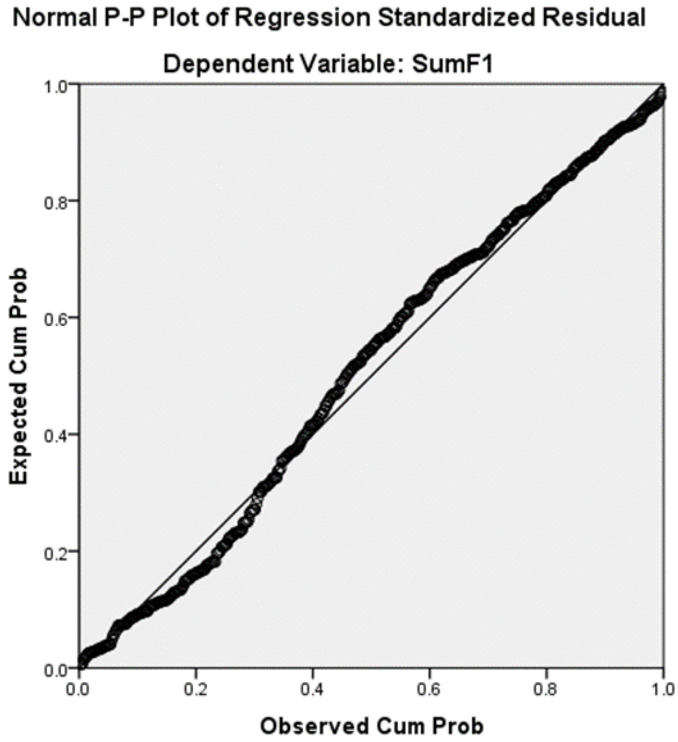
Appendix 7c Tests for assumptions for multivariate analyses for Factors 1-3: Students

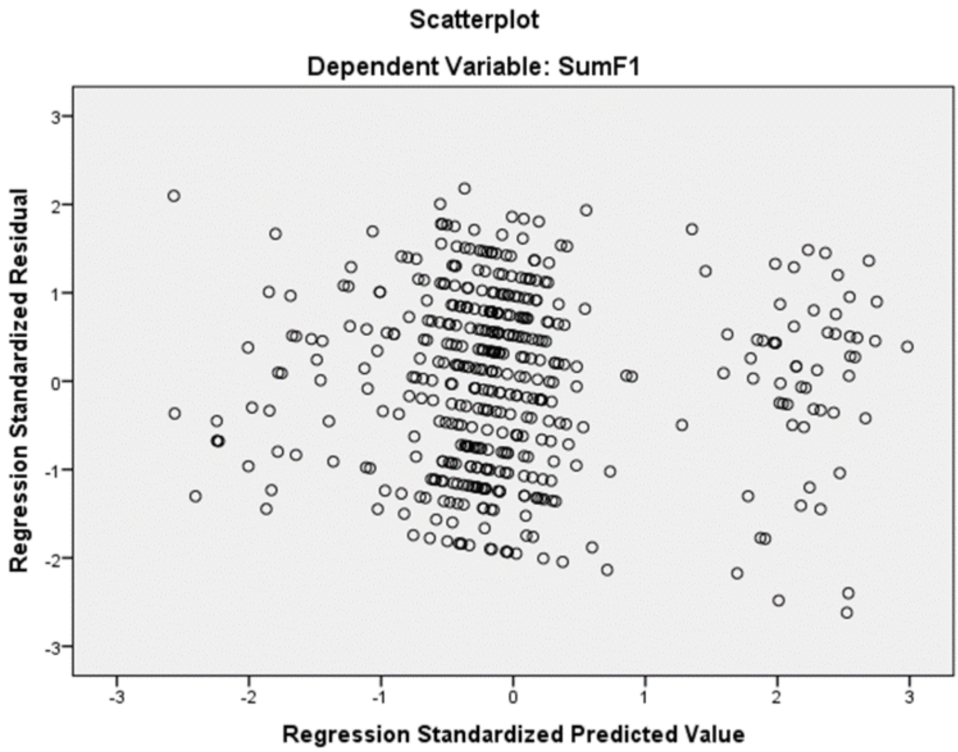
Normal distribution residuals, homoscedasticity and linearity

Preliminary analyses revealed the residuals were normally distributed, linear and homoscedastic. P-P plot and scatter plots showed residuals met these criteria. The researcher examined the results for outlier cases by inspecting the Mahalanobis' and Cook's distance (Tabachnick & Fidell 2014). The Mahalanobis critical value of 16.27 for 3 variables suggested by Tabachnick and Fidell (2014) was exceeded in only two of the cases. None of the cases' values had a Cook's distance of greater than one, so outliers were not removed.

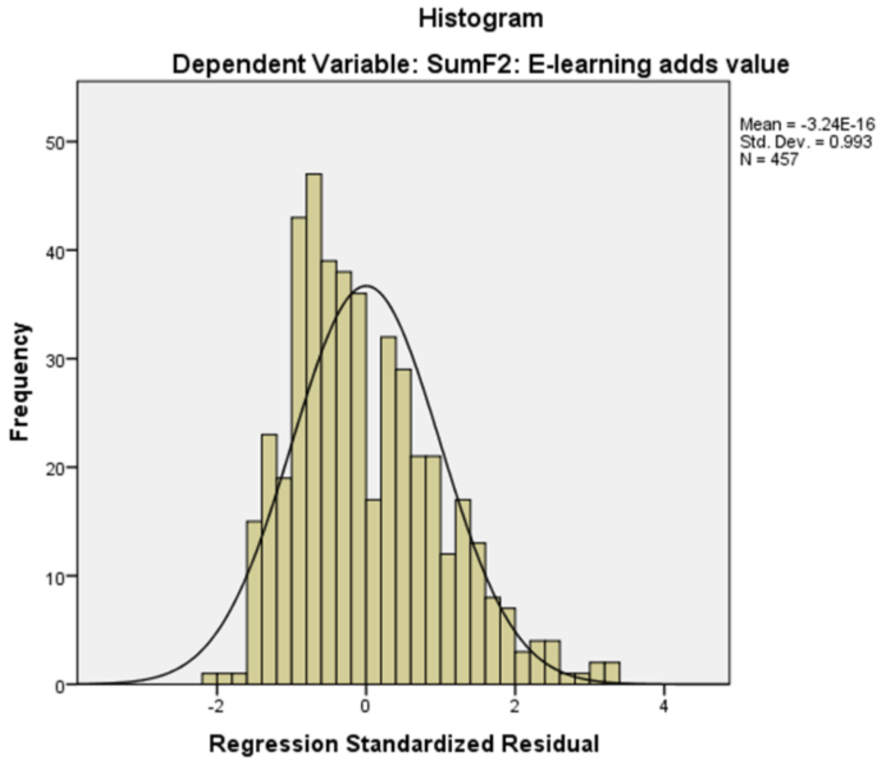
F1 "Database searching is difficult"

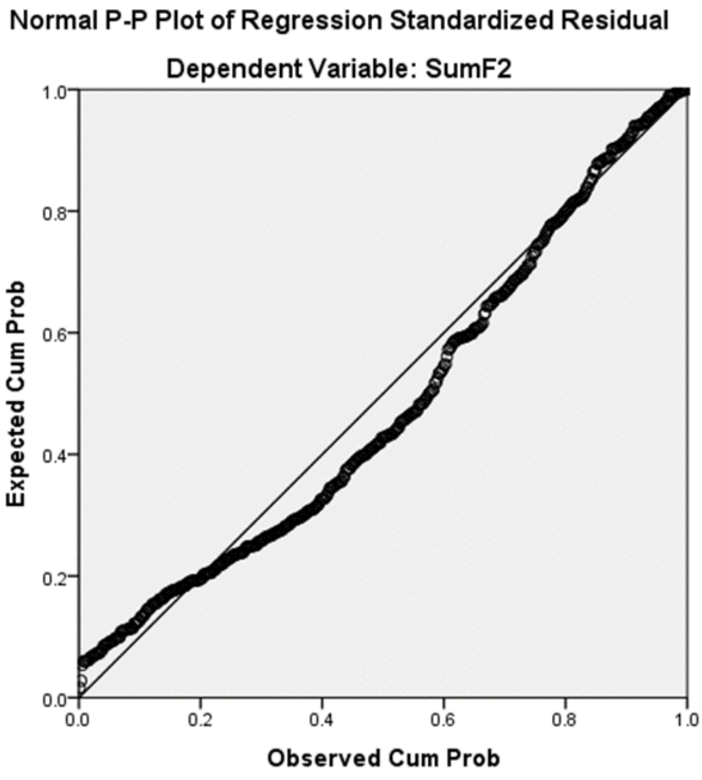


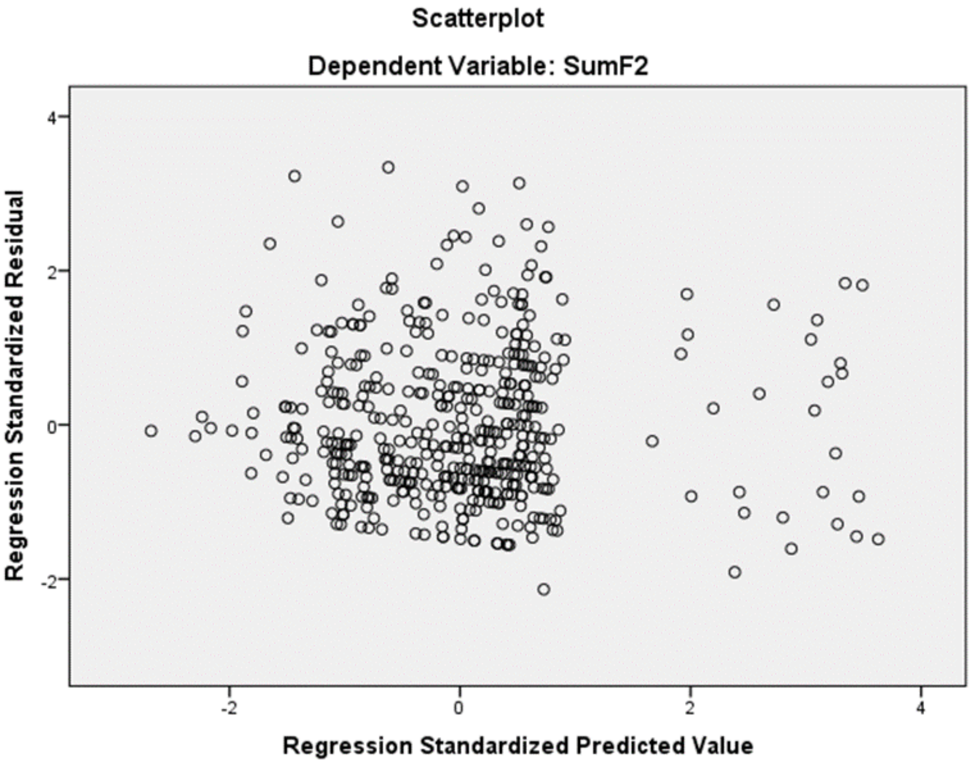

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: SumF1
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: SumF1
Regression Standardized Residual
Regression Standardized Predicted Value
-3
-2
-1
0
1
2
3

F2 "E-learning adds value"



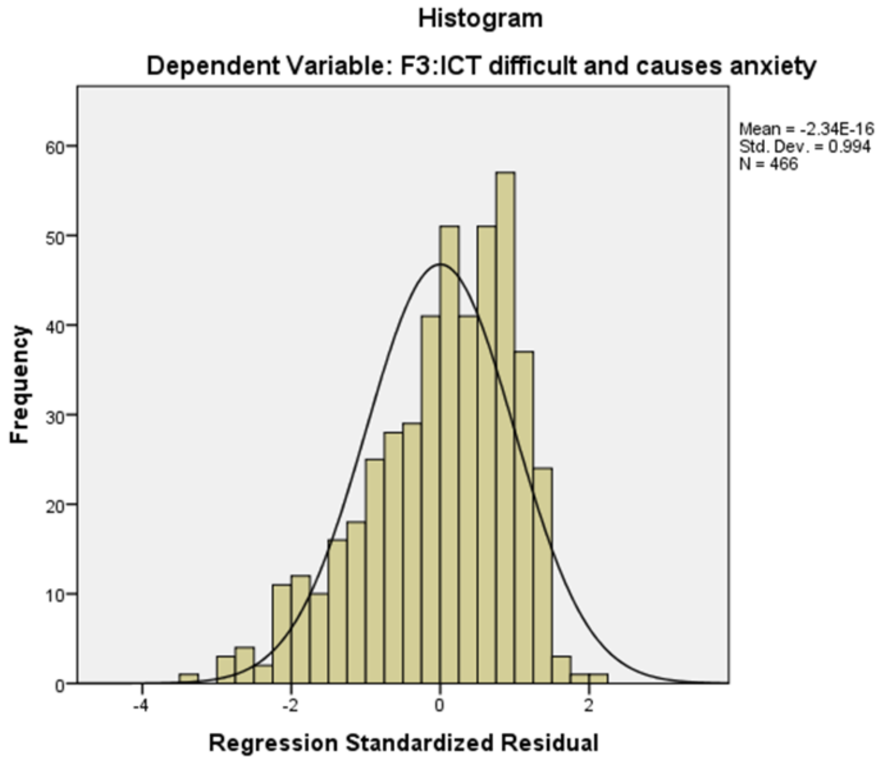


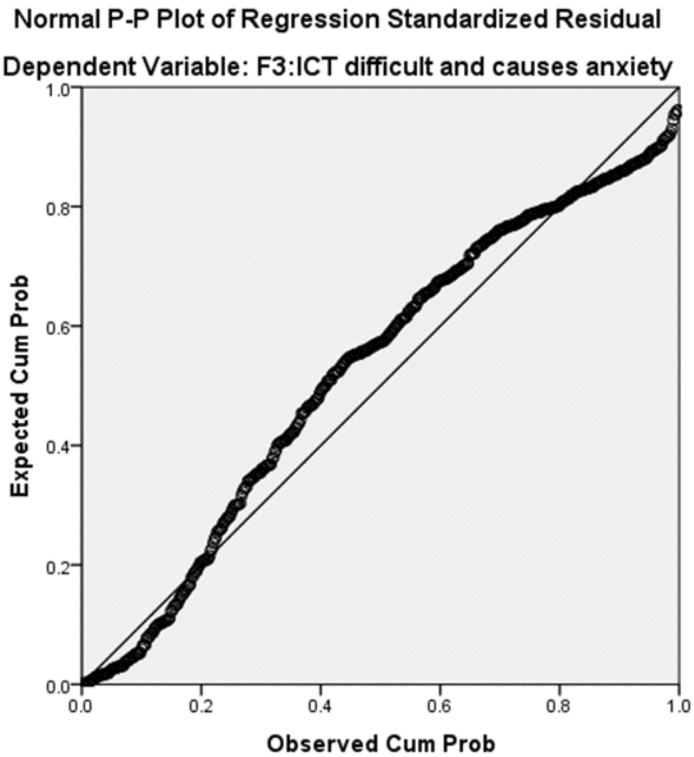


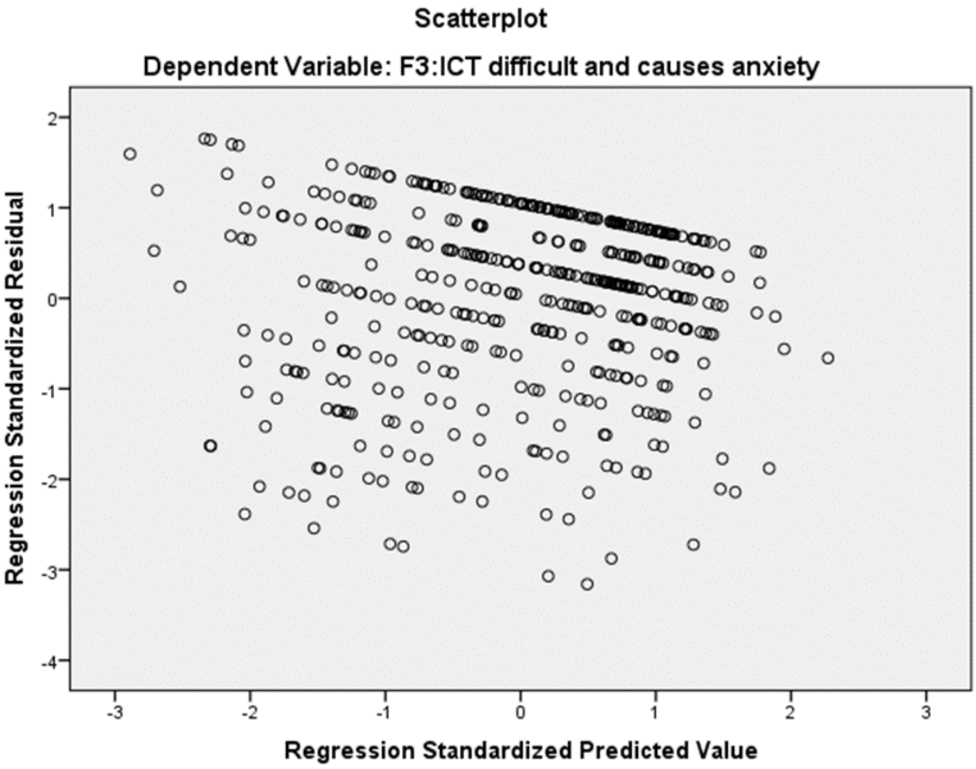
The histogram of standardised residuals and the normal P-P plot indicate that the data contained approximately normally distributed errors for both Factors 1 and 2.

The scatter plot of standardised residuals showed that the data largely met the assumptions of homogeneity of variance and linearity.

F3 “Using ICT is difficult and causes anxiety”



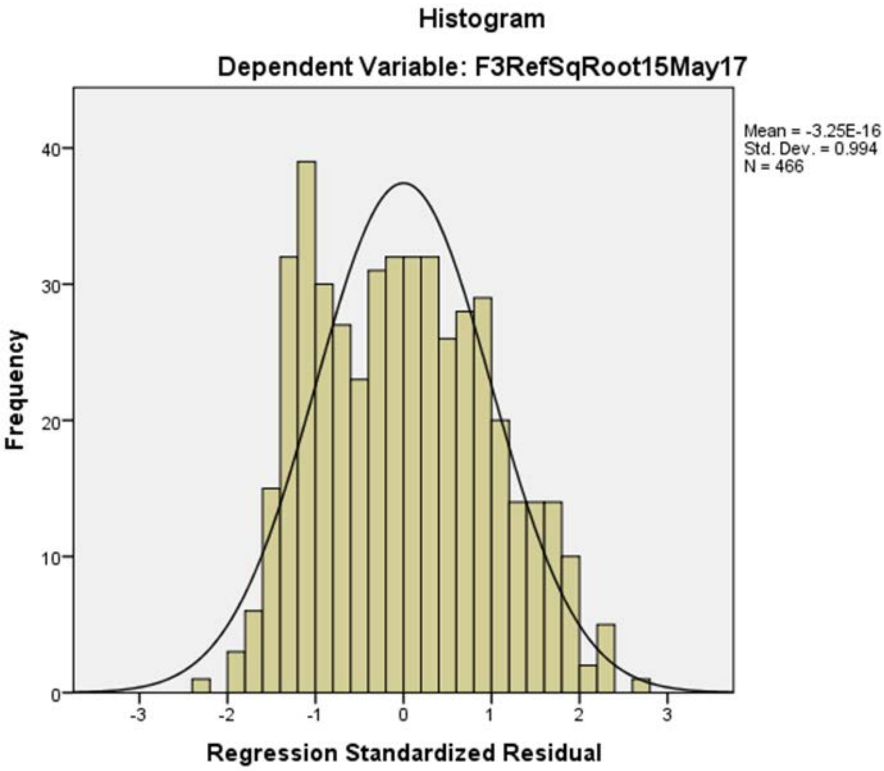


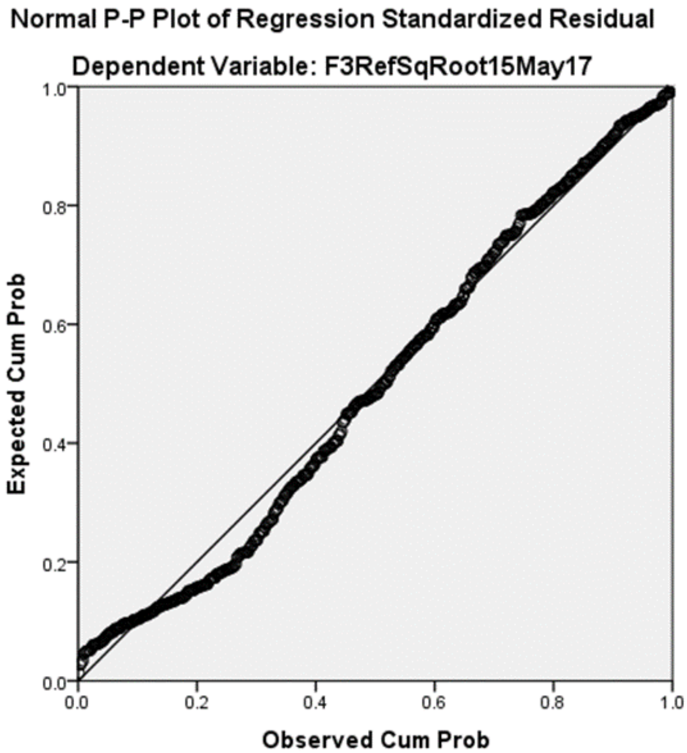


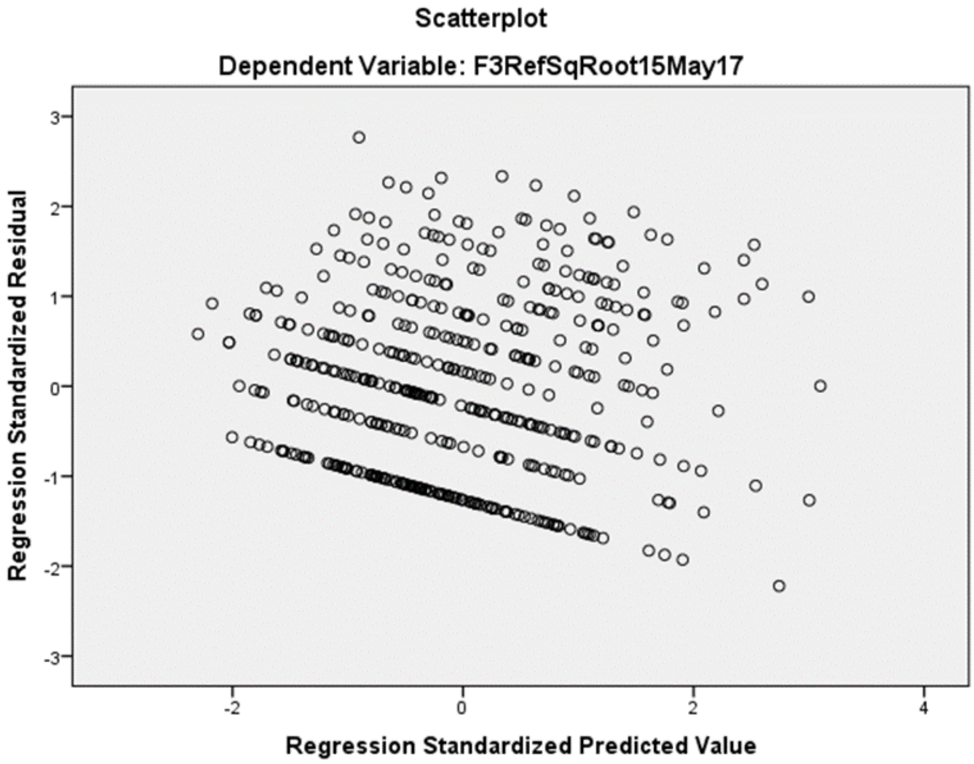
The histogram of standardised residuals and the normal P-P plot indicate that the errors were not normally distributed for Factor 3.

The scatter plot of standardised residuals showed that the data did not meet the assumptions of homogeneity of variance and linearity.

F3 “Using ICT is difficult and causes anxiety” (reflected, square root transformation)







The histogram of standardised residuals and the normal P-P plot indicate that the data contained approximately normally distributed errors for Factor 3 after transformation.

The scatter plot of standardised residuals also showed that the data largely met the assumptions of homogeneity of variance and linearity.

App. Table 7-54 Multicollinearity: Students

	Collinearity Statistics F1		Collinearity Statistics F2		Collinearity Statistics F3 (reflsqrt)	
Independent Variable	**Tolerance**	**VIF**	**Tolerance**	**VIF**	**Tolerance**	**VIF**
Age	0.96	1.04	0.96	1.04	0.96	1.04
Gender	0.98	1.02	0.98	1.02	0.98	1.02
IRSD	0.97	1.03	0.97	1.03	0.97	1.03
ESL	0.96	1.05	0.96	1.05	0.96	1.05
Hours on Internet	0.96	1.04	0.96	1.04	0.96	1.04
Information Literacy	0.98	1.02	0.98	1.02	0.98	1.02

F1: “Database searching is difficult”

F2: “E-learning adds value”

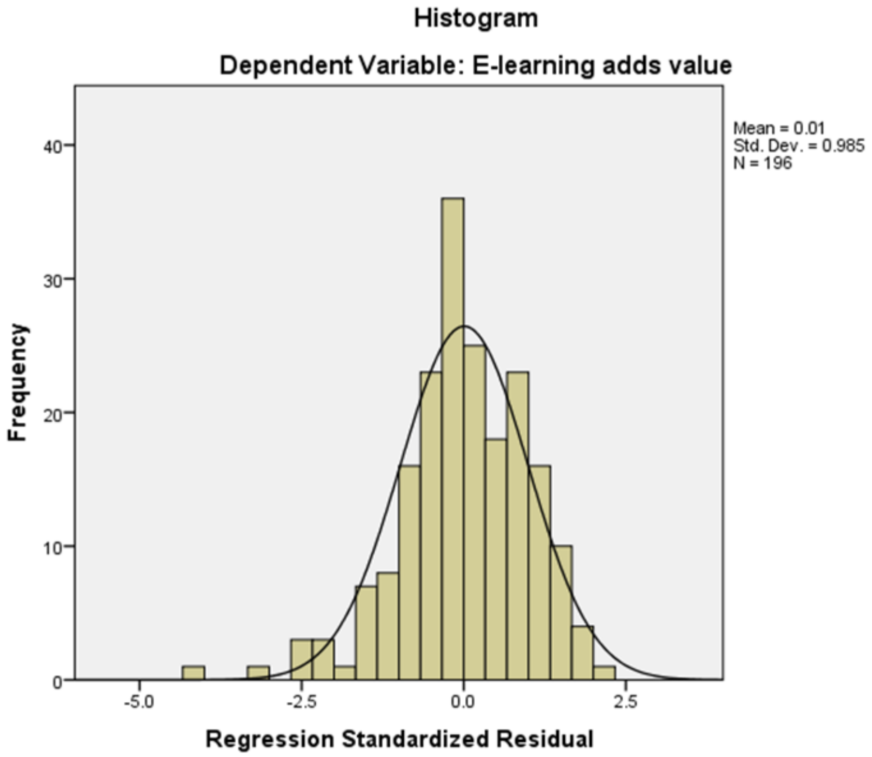
F3: “Using ICT is difficult and causes anxiety”

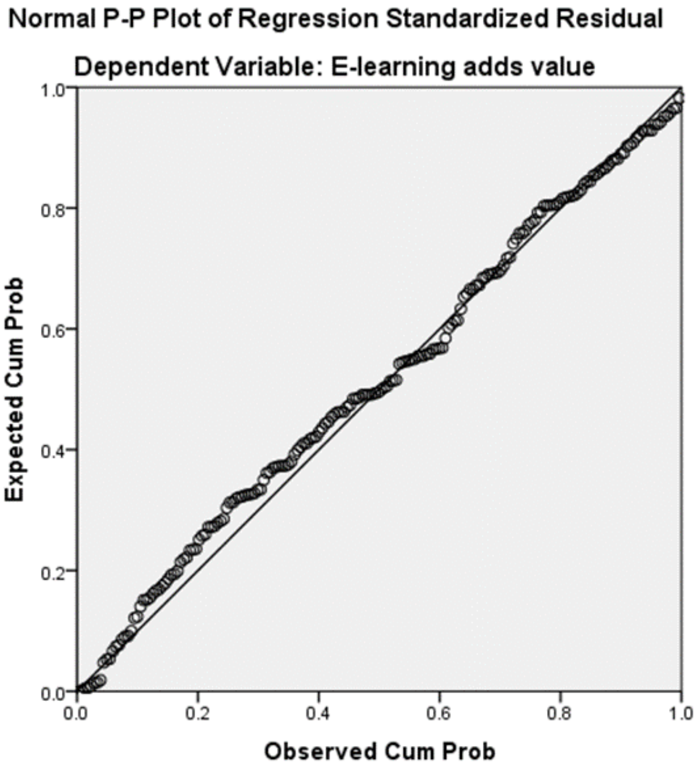
In all cases, Tolerance exceeds 0.1 and VIF is less than 10, therefore the assumptions relating to multicollinearity have not been violated (Pallant 2013, p. 164).

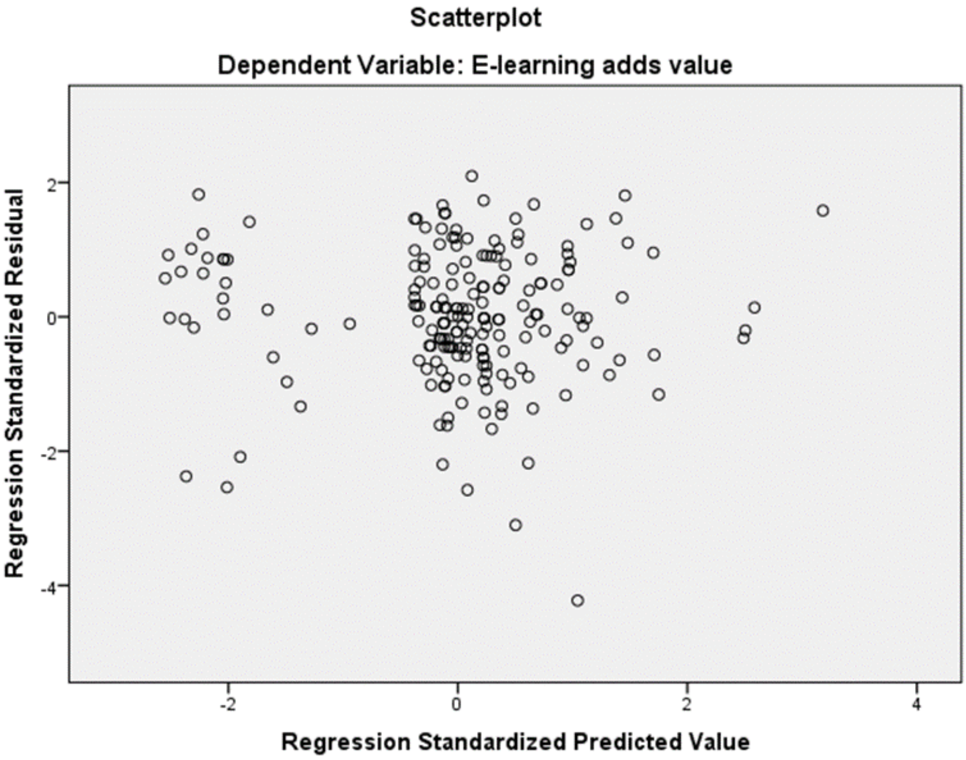
Appendix 7d Tests for assumptions for multivariate analyses for Factors 1-3: Academics

Normal distribution residuals, homoscedasticity and linearity

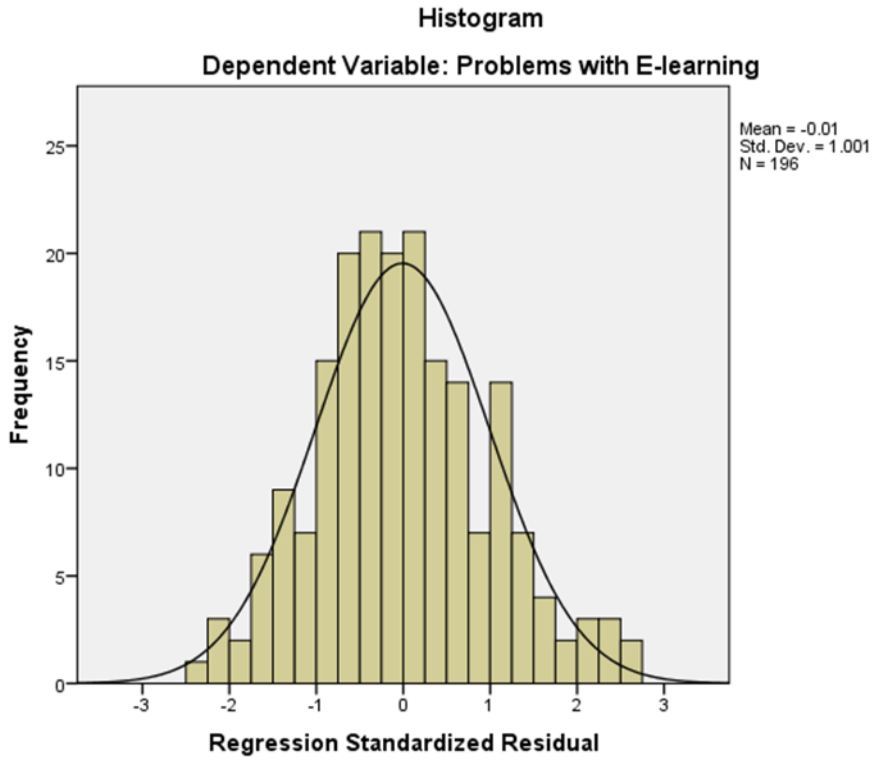
F1 “E-learning adds value”

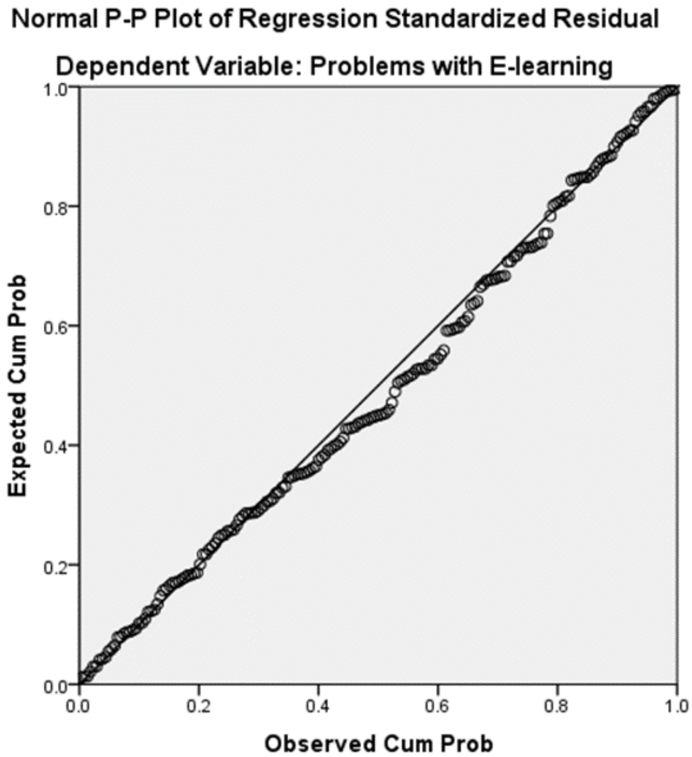


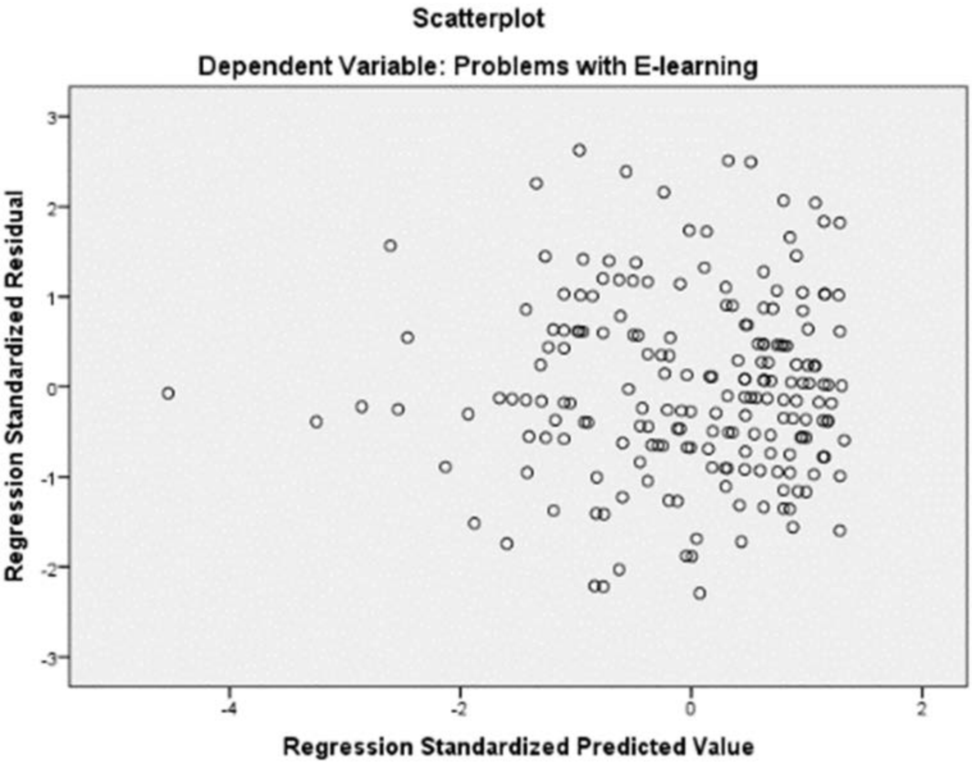

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: E-learning adds value
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: E-learning adds value
Regression Standardized Residual
Regression Standardized Predicted Value
2
0
-2
-4
4

F2 “Problems with E-learning”



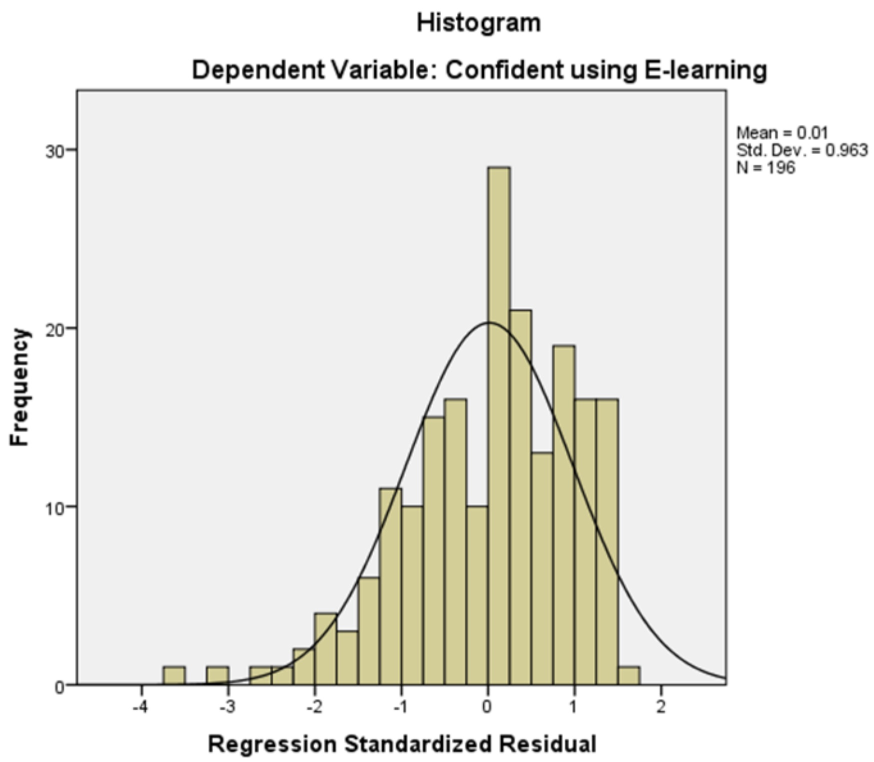


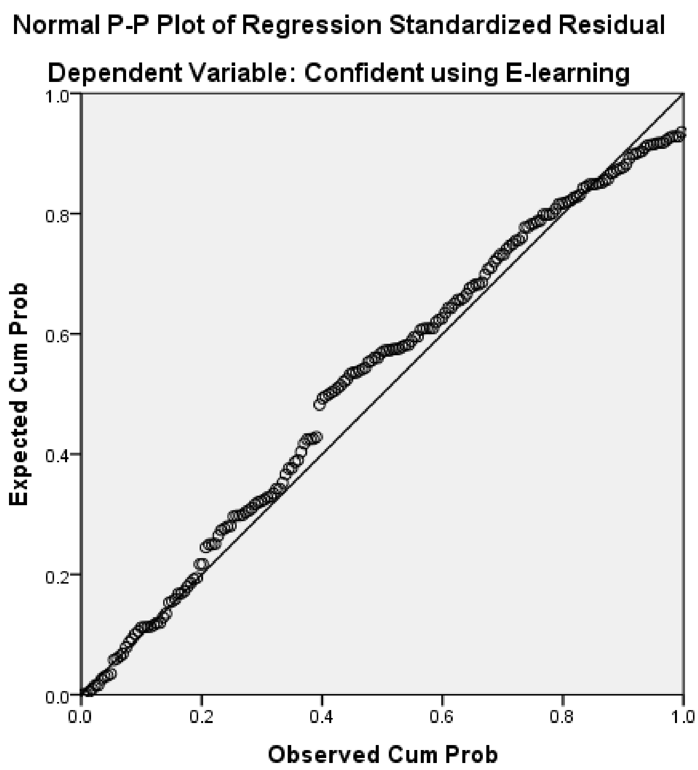


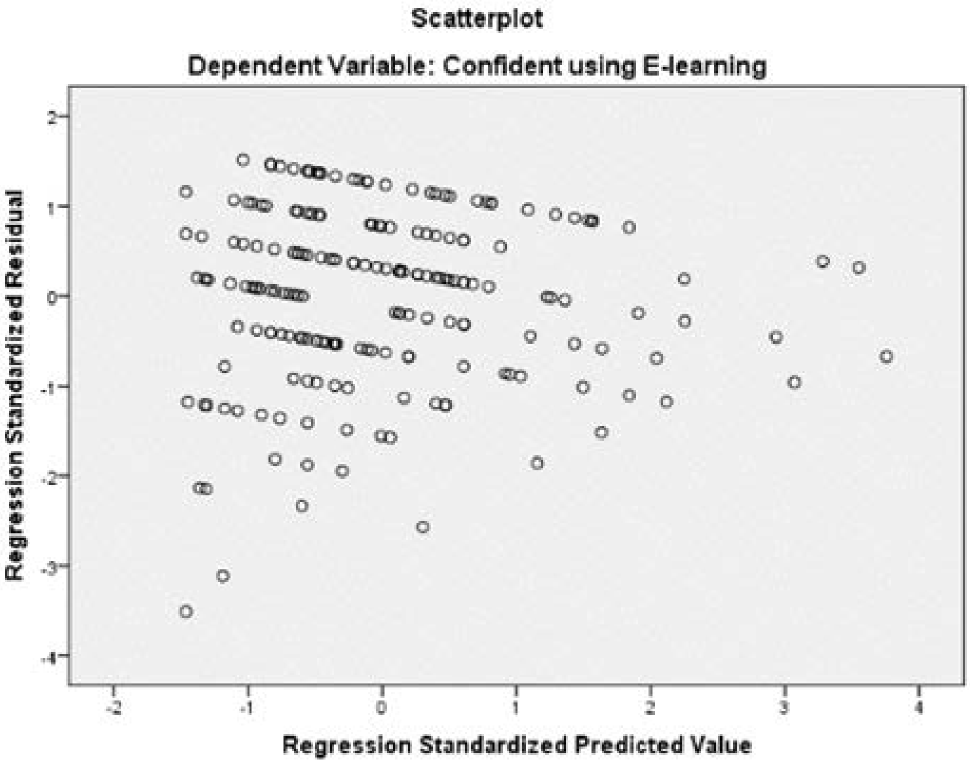
The histogram of standardised residuals and the normal P-P plot indicate that the data contained approximately normally distributed errors for both Factors 1 and 2.

The scatter plot of standardised residuals showed that the data largely met the assumptions of homogeneity of variance and linearity.

F3 “Confident using E-learning“



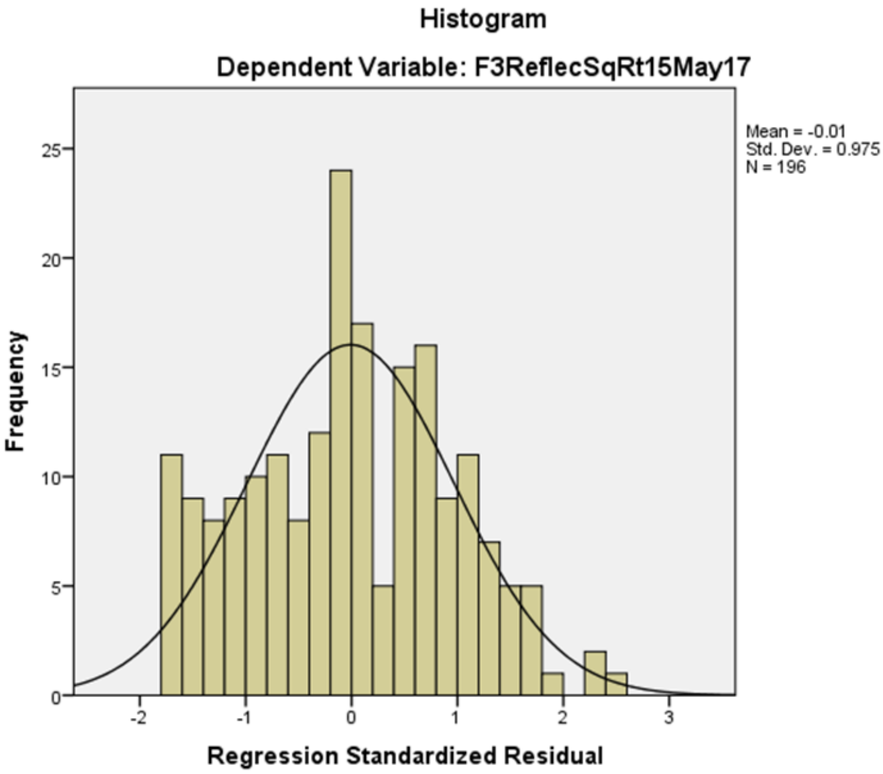


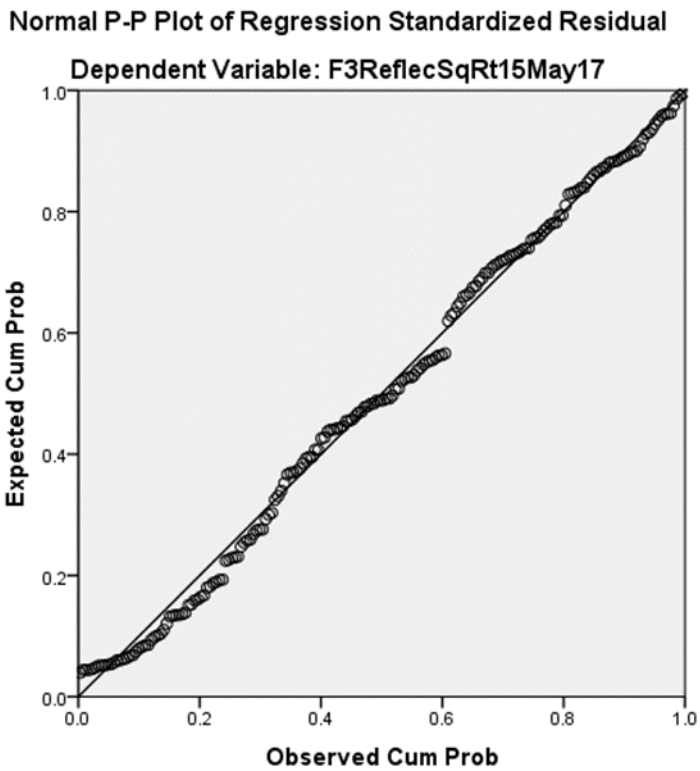


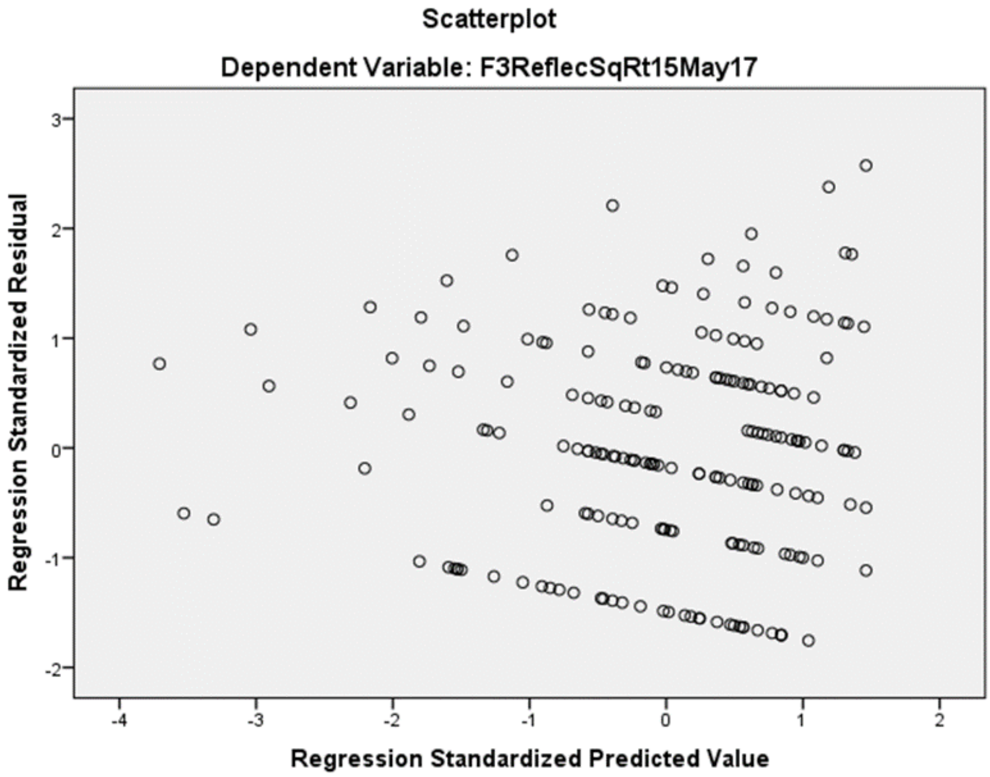
The histogram of standardised residuals and the normal P-P plot indicate that the errors were not normally distributed for Factor 3.

The scatter plot of standardised residuals showed that the data did not meet the assumptions of homogeneity of variance and linearity.

F3 "Confident using E-learning" (refsqrt transformation)







The histogram of standardised residuals and the normal P-P plot indicate that the data contained approximately normally distributed errors for Factor 3 after transformation.

The scatter plot of standardised residuals also showed that the data largely met the assumptions of homogeneity of variance and linearity.

App. Table 7-55 Multicollinearity: Academics

	Collinearity Statistics F1		Collinearity Statistics F2		Collinearity Statistics F3 (reflsqrt)	
Independent Variable	**Tolerance**	**VIF**	**Tolerance**	**VIF**	**Tolerance**	**VIF**
Years Employed	0.98	1.02	0.98	1.02	0.98	1.02
Gender	0.99	1.01	0.99	1.01	0.99	1.01
Hours on Internet	0.98	1.02	0.98	1.02	0.98	1.02

F1: "E-learning adds value"

F2: "Problems with E-learning"

F3: "Confident using E-learning"

In all cases, Tolerance exceeds 0.1 and VIF is less than 10. Therefore, the assumptions relating to multicollinearity have not been violated (Pallant 2013, p. 164).

Appendix 9a National Registered Nurse Standards for Practice

(Use the Alt and Left arrow keys to return to previous location in thesis. *Please use these hot keys for all appendices' navigation)

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Nursing and Midwifery Board of Australia. (2016). "Registered Nurse standards for practice."

http://www.nursingmidwiferyboard.gov.au/Codes-Guidelines-Statements/Professional-standards/registered-nurse-standards-for-practice.aspx accessed 28/11/17

Appendix 9b Canadian Nursing Informatics Entry-to-Practice Competencies for Registered Nurses

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Canadian Association of Schools of Nursing Association Canadienne des écoles de Sciences Infirmières. (2013). "Nursing Informatics Entry-to-Practice Competencies for Registered Nurses." from http://www.casn.ca/wp-content/uploads/2014/12/Nursing-Informatics-Entry-to-Practice-Competencies-for-RNs_updated-June-4-2015.pdf __Accessed 28/11/17

Appendix 9c Informatics competency from the Quality and Safety Education for Nurses (QSEN) (2012) Comptencies Graduate KSAS

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Quality and Safety Education for Nurses (QSEN). (2012). "Comptencies Graduate KSAS." Retrieved 27 March, 2015, from http://www.aacnnursing.org/Quality-Safety-Education

Accessed 28/11/17

Source: (Quality and Safety Education for Nurses (QSEN) 2012 p.14-17)

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