

**FACULTY TOOLS AND TECHNIQUES USED TO ASSESS ASSOCIATE DEGREE
NURSING STUDENT LEARNING WHILE USING HANDHELD DIGITAL DEVICES**

by

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Abstract

Many nursing programs utilize digital eBooks as well as nursing applications that contain specialized nursing tools. A gap in the literature review demonstrated the need for research into the best practice for assessing student learning obtained with handheld digital devices. The purpose of this research study was to explore the tools and techniques nursing faculty members use to assess the nursing student's ability to retain the information that had been obtained through the handheld digital device. One of the questions that was examined in this research was as follows: How do nursing instructors assess Kolb's experiential learning theory with the nursing students that are using handheld digital devices? The subquestions in addition to the primary question were as follows: (a) How do handheld digital devices impact vertical learning and (b) How does handheld device usage impact the long-term memory and working memory? A basic qualitative study was used to explore the influence on vertical learning transference into long-term memory during use of handheld digital devices. The population and sample of this study was associate degree nursing faculty from the Midwest region of the United States. The study participants ranged in age from 25 to 64 years of age, and they all had been teaching for at least a full academic year. The purpose of the study was to examine the tools and techniques used by faculty to assess student learning and transferability of that learning to working memory. Results from the research show nursing faculty felt students are not retaining learned information from class to class regardless of how the information is presented, and there were no specific tools being used by faculty to measure learning through the use of handheld digital devices. Recommendation for additional studies would include the use of a larger sample size.

Dedication

I wish to dedicate this dissertation to my husband. I could not have walked this path without your never-ending, unconditional love. From my first course to the fear that I might never stop finding new courses, I thank you from the deepest part of my heart.

To my children, Kat, William, and Shea, you are my inspiration to keep going. You will never know what it means to me when one of you ask me how my classes are going. I hope you continue to find the fun in education. To Jennifer, without your urging I would never have advanced past my ADN; it is your turn. To Andy, you were so full of love and found no way to express it. You were always so proud of everyone else's accomplishments but could not find your own; we miss you.

To all of my students, never stop learning. Life is all about learning. Failure is learning, success is learning, and most importantly, knowing that there are things you do not know is learning! Find a way to practice learning every day.

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CHAPTER 1. INTRODUCTION

Digital technology, in the form of handheld digital devices, such as tablets and smartphones, is being incorporated into nursing education for the enhancement and engagement of teaching and learning (Day-Black & Merrill, 2015). The following research study was conducted to further the understanding of what, if any, assessment tools are used to evaluate student learning through the function of handheld digital devices. The practice of using handheld digital devices and technology in nursing education has increased substantially over the last decade, leading to an intensified need to develop compatible assessment tools to evaluate the effectiveness of learning through this approach (Mackay, Anderson, & Harding, 2017).

Nursing faculty are using technology to deliver student learning. This researcher sought to understand how the faculty members were assessing students' learning process as they move through Kolb's experiential learning theory (ELT) (1984) with technology. Kolb's theory of ELT has been used to describe how a student's brain works to process information during a learning event. Kolb's ELT four-step cycle examines how the brain transfers a concrete event into a reflection of the experience that allows the brain to categorize the experience. At the same time, the brain compares the new experience to any previously stored events. Kolb's cycle does not have a starting place or an ending spot but allows the student to continue building on their knowledge base. A student can enter the cycle at any point and still learn. Hill (2017) studied the nursing student's ability to learn through the use of the ELT cycle by expending the theory

lecture knowledge to a follow-up practical knowledge active learning activity. ELT can be used to assess learning in many aspects of nursing schools.

The adult learning theory, developed by Malcolm Knowles (Knowles, Holton, & Swanson, 2015) was pivotal to this research study of nursing educators. College receives learners entering into secondary education as adults, ranging in age from 15 to 64 years old (Spies, Seale, & Botma, 2015). The teaching strategy of pedagogy positions the educator as the manager of the educational process. Pedagogy has been primarily used for child education. There has been a transformation of secondary education into the use of Knowles et al. (2015) theory of andragogy, where the adult learner is the master of the education process, and the instructor is the facilitator of the process. While Knowles's theory is not the primary theory used for this research study, the principle of adult learning was taken into consideration since the nurse educators were developing the learning activities based on the adult student, as well as observing the adult learner during the use of handheld digital technology.

Background articles reviewed provided an abundance of research related to nursing education amid technology and the perceived tolerance of technology usage from students, educators, and patients (Beers & Berry, 2015; Day-Black & Merrill, 2015; Forehand, Miller, & Carter, 2017; Gallegos & Nakashima, 2018). Supplementary studies discussed the engagement enhancement of students during technology-based learning activities (Tang & Barnett-Ellis, 2017). The benefits described for students included the ability to have resources readily available and study material being less awkward to carry (Guo, Watts, & Wharrad, 2016). Another use of technology was seen in the growing field of simulation laboratories. High-fidelity patient simulation technology has changed student training in the laboratory. The simulator technology has been used to replace specialty nursing clinical areas, such as pediatrics and obstetrics, due to

the increase of nursing schools competing for clinical assignments locations (Curl, Smith, Chisholm, McGee, & Das, 2016).

The research contributes to the current study by highlighting the constructive influence that technology has played in nursing education. However, these studies did not address the assessment tools being used to evaluate student learning. The gap found was in understanding how the faculty is testing the effectiveness of digital learning. Additional questions into what impact the instant search feature plays in solidifying nursing concepts on student nurses, and are students capable of obtaining an overall picture of nursing care from handheld digital devices, remain unanswered. When a student was asked how they felt about technology, research studies yielded student perceptions related to; convenience, easy to search, studying on the go, and modern (Guo et al., 2016). This researcher developed interview questions that focused on nursing faculty members and about the assessment tools and techniques the faculty members use to evaluate how well the student has learned by using the technology from handheld digital device.

Additionally, supporting the need for this research study was found in the use of digital textbooks for students. Many nursing schools offer digital textbooks for their learners. Mennenga (2016) found that overwhelmingly, the nursing student preferred using printed textbooks over the use of digital. Of interest was the student complaints that the internet was a distraction to their studies, as was eye strain with staring at a computer screen. A nursing program that offered students the choice of digital or printed textbooks was used for this study. In addition to the digital textbook, the students are required to purchase a subscription to a digital nursing application that contains several integrated applications that are web-based.

Chapter 1 delivers a background for the study of technology usage in the nursing curriculum. The need, purpose, and significance of the research study will be offered in support of extending the field of teaching and learning. A statement of the research question, key terms associated, and research study design will be proffered as well as a synopsis of the assumptions and limitations for this study. In the conclusion of Chapter 1, there will be a depiction of the organization of the remainder of the study.

Background of the Study

In the early 1980s, technology was first used for nursing in the hospital administrative venue. Nursing managers used personal computer workstations to conduct business. Researchers den Hartigh, Ortt, van de Kaa, and Stolwijk (2016) provided evidence of the early years of IBM and Apple products being used for industry. The term used to describe this new field for nursing was nursing informatics (Cummins, Sward, & Guo, 2015). The equipment involved used large desktop computers, or free-standing workstations (den Hartigh et al., 2016). Gradually, the technology and equipment were introduced to the hospital nursing units. The Health Information Technology for Economic and Clinical Health Act of 2009 (HITECH) was responsible for offering financial incentives for hospitals to begin the use of electronic patient health records as a way to streamline charts and patient records (Halamka & Tripathi, 2017). The increased practice of electronic health record usage supported a need for nursing school to offer competency training in technology informatics. Nursing programs in the late 1990s began to incorporate a required course in nursing informatics into the school's program required hours (Bove, 2020). This informatic course taught the users the necessary skills of operations of a windows-based computer. Steps as simple as turning on the computer were taught to students. It was during that same time that the field became a specialty for professional nurses, and those interested nurses

could focus their practice on nursing informatics (Cummins et al., 2015). Twenty years later, nearly every student owns a smartphone with internet capability that is used daily. The nursing programs have integrated informatics into daily activities, and there is no specific course that must be taken (Bove, 2020). Many nursing students have received formal training in computer and technology usage during their primary school education.

The nursing curriculum has integrated technology into several areas that interface with students. One example is found in the learning management systems (LMS) such as Blackboard and Desire 2 Learn (D2L). An educational LMS is a web-based environment which houses the student's information about the course, is one way the student is becoming technologically trained (Judge & Murray, 2017). Students use the internet to access the LMS for course content, syllabus information, and class activities. High-fidelity manikins are linked to computer programs that can be adjusted for use in the simulation laboratory for life-like simulations. Students utilize computer technology for the completion of case study simulation activities (Papp, Deeb, Booth, El-Sayed, & Freilicher, 2018). Additionally, many students use handheld digital devices such as tablets or smartphones to access nursing applications that contain items of convenience like medical conversion calculators, drug guides, and medical dictionaries. It should be made clear that initial pre-licensure degrees are not offered in an online-only format (National Council of State Boards of Nursing, 2019). Students must attend a school of nursing program that includes theory, laboratory, and clinical experiences conducted in a face to face environment.

Echenique Gallardo (2014) devised the linguistic expression of the *digital era* to describe learners in the present-day generation, as well as to explain the explosion of nursing curriculum designs that features technology integration of handheld digital devices. Students learning in the

digital era, expect that during class, laboratory and clinical activities will have a technological element. Hussey and Kennedy (2016) found that informatics in nursing education had attempted to increase technology in all areas of the curriculum. Their research was found to be a positive impact on patient outcomes. The integration of technology is driven by the recommendations of the Institute of Medicine, Quality and Safety Education of Nurses, and American Association of Colleges of Nursing for increased patient safety and outcomes (Merrill, 2015) The insertion of handheld digital devices for increased ability to search and access nursing resources has been experienced in nursing schools (Forehand et al., 2017). Associate degree nursing programs in the United States now have the option to use hard copy textbooks or to have students purchase a digital textbook package that would be used for the life of their course work for the program. One community college that listed this book bundle requirement was located on the Internet. The specification displayed on the school website detailed a technical requirement for students to buy a tablet and digital textbook bundle. The digital bundle is used for the duration of the student's work in the nursing program and include electronic applications for medical dictionaries, dosage calculators, and drug reference books. The students are trained on how to use handheld digital devices to access their textbooks. The digital textbooks contain features that allow for digital highlighting, digital flash-card construction, and convenient searching ability. The digital textbooks can be downloaded directly to their tablet for portability or viewed online.

The faculty usage of technology in curriculum design for theory and clinical nursing education has been an ongoing topic of research (Mackay et al., 2017; O'Connor & Andrews, 2015; Raman, 2015). Raman (2015) conducted a literature review that looked at the increased usage of handheld technology in nursing education and into the curriculum that is used to teach undergraduate nurses. There is an increased usage of handheld technology in the clinical area as

noted by O'Connor and Andrews (2015). The researcher found the positive aspects to be the improved communication with other health care team members as well as the ability to have instant access to patient records produced improved patient outcomes. The study's focus included interactive student work online, such as online quizzes and group discussion questions. The examination of the instructor's sentiments related to students using technology in the educational environment had been examined through qualitative studies. Additionally, student interviews have been conducted to determine the student's impressions (O'Connor & Andrews, 2015). Several common themes appeared from these studies. One theme discovered was the lack of consistency being used for the language to describe what is considered digital devices. Additional issues noted in research provided by Mackay et al. (2017) include there is a lack of faculty propensity and skill with technology, student expressed concerns with the increasing cost of devices, internet access issues, and a lack of standardized technology skill level being displayed from students. Instructors are given access to print copies as well as to the digital copies of the instructional textbooks. Gueval, Tarnow, and Kumm (2015) found the majority of instructors use the printed version as the primary reference during course construction, with a smaller number of faculty utilizing a desktop computer to view the digital book online. The least amount of faculty used handheld digital devices for viewing for the course textbooks. A lesser subgroup of faculty that utilize the digital textbooks found value in the use of the electronic highlighter feature that can be shared with their students. The faculty member creates a highlighted notation on the electronic textbook, they can offer the student a link to the specific passages that have been highlighted. Many faculty members offer the student a subscription link that provides access to all highlights and tagged passages created by that specific faculty member for the entire course.

Nursing students interviewed with the use of qualitative research methods (Creswell, 2003) provided enthusiastic statements about having the entire collection of nursing textbooks at their fingertips. Additionally, having the textbook collection contained in a lightweight digital format makes studying a mobile experience. Student's recounted stories of being able to study from the bleachers at a child's sporting practice, as well as expressing relief in the decrease from back strain. An additional student perception is the ability to use the search engine to quickly locate a key-word or passage in the electronic versions. Another comment noted was that students do not read a textbook from cover to cover but instead, only read the assigned chapters in a scanning method, the search feature assisted in making the digital copy easier to scan for the specific readings.

Among the unfavorable findings for students was the lack of assessment into student capabilities and skill level with technology. Echenique Gallardo (2014) uncovered research that nursing educators often held assumptions that students' already possessed computer competency skills. An example of complications faced by the erroneous assumption was seen when a student had experience with using a particular operating system such as Windows, and the nursing programs technology is not using a comparable format. These students required additional time to adjust and to be trained on the unfamiliar program as well as on the required device. The necessary training took time away from the allotted planned teaching hours for many instructors, creating the need for modification to the instruction hours. (Echenique Gallardo, 2014).

Price et al., (2018) found that students with a decreased ability to operate technology struggled during the initial weeks of nursing school orientation and subsequently encountered the result of falling behind the other students. The lack of access to the textbooks created a delay in learning of the assigned material. This initial delay created a harmful consequence that some

students could not recover from academically. The challenge described laid the foundation for a decrease in student success in the course (Price et al., 2018). Students relied on faculty to assist them in understanding the programs and technology. However, a complication to student use of the technology was the difficulty for the instructor to manage the technology themselves. The lack of faculty training courses and the speed at which technology changed created a decreased ability to assist the student. Student satisfaction was reduced due to this inability to provide proper technical support (Day-Black & Merrill, 2015). Students purchased the digital package but also commented they rented or bought the printed versions. Some students use the printed version at home and the digital version in class, laboratory, and clinical. Other students stated they purchased the printed text and had never opened the digital copies.

Patient care areas create faculty reluctance to permit students to utilize technology due to concerns over release of patient information and identifiers. Protection of patient's privacy and the privacy of records and information is of great concern to all in health care. The possible violation of the law that deals with the patient privacy Health Insurance Portability and Accountability Act (HIPAA) of 1996 is the most often cited fear (U.S. Department of Health and Human Services, 2019). The release of personal identifiers to social media applications have been documented in research studies as well as in the nightly news reports. Cellphones in patient care areas have been the catalyst for careless regard to the protection of the patients right to privacy. The health care organizations have reacted to litigation and fines resulting from the violations by issuing policies for monitoring of the use of the various application. Professional nursing organizations have also established a statement regarding the usage of technology and social media in nursing. With laws and declarations, health care organizations have also enacted policies to protect patients and their medical records. Nursing faculty have struggled with

allowing students to bring cellphones or tablets into the clinical locations. The concerns were explained as being related to the device having photography capabilities. Pictures of patients or photocopies of documents being photographed have been known to be leaked to news and social media, especially for high profile patients. Most health care facilities restrict the usage of handheld digital devices to non-patient care areas only. Staff members are required to place their phones and tablets in their locker, and students have been requested to cover the camera lens with tape and to limit the use of the tablets to the staff breakroom or the conference room only (Billingsley & McKee, 2016).

An additional faculty concern was related to the student being distracted during class, laboratory, and clinical. Studies have revealed that students that bring their handheld devices to class, lab, and clinical are accessing sites not related to the content being covered. Social media, online stores, sports updates, as well as texting messages to others in and out of the class are some of the activities being observed by faculty (Bautista, 2019). Of the students that use handheld devices to take notes, many admitted they stray unconsciously to personal use activities during instruction time (Gallegos & Nakashima, 2018).

Concern expressed by patients and their families have been addressed in the research (Alsayed, Bano, & Alnajjar, 2019). Seeing a student on a cellphone or handheld digital device, family and patients tend to believe that the student is accessing social media instead of working on patient care activities. Another patient concern communicated was the fear that the student was dependent on technology and did not possess the knowledge necessary for competent care. The patient feared the student was unsure of what care was appropriate and needed the internet to search for proper actions of care (Billingsley & McKee, 2016). The lack of confidence in student

knowledge is becoming a growing concern with faculty as well, this fear was expressed by a study participant during field observations for the current study.

In the field of technology usage in nursing education, there is a lack of research that is directed to the evaluation of tools and techniques used to assess the student's ability to learn from the handheld digital device. No research studies have been located that examine Kolb's experiential learning theory while students use digital methods for learning. There is a need for established approaches into how nursing faculty are assessing the learning that is taking place with the use of handheld digital devices. The obligation to verify teaching techniques to support the overall effectiveness of learning through technology will assist not only nursing faculty but could reach across several educational disciplines.

Need for the Study

Nursing programs have increased the use of technology usage into the learning curriculum (Raman, 2015) however, a closer look displayed a lack of research into the tools being used to assess the reliability of learning through the use of technology. A gap in the research exists when looking at the evaluation methods used by nursing faculty to assess student learning while using handheld digital devices. Understanding the impact of how the quickly obtained information is assimilated into the learning process of the students is of interest to educators. Research of how the continued use of a digital search engine is shaping the learning experience on working memory and long-term memory storage of the nursing students will strengthen curriculum design models. Failure to evaluate learning retention leaves faculty with no evidence-based standards to justify the continued use of handheld digital devices for student nurses. The literature available shows evidence of a lack of studies explicitly looking at the learning process, assimilation, and organization of the students' learned material. The possibility

exists that long-term memory could be suffering due to having quick access to information, creating a decrease in stored data in the student's long-term memory (Guo et al., 2016).

Purpose of the Study

The purpose of this basic qualitative study was to explore faculty perception of student learning and assessment of the use of handheld digital device usage. The use of technology for learning activities have been demonstrated in research to provide a positive aspect for students with the use of twitter, virtual learning environments, electronic audience response systems and hybrid or blended courses (Chicca & Shellenbarger, 2018). Interactive games such as products Kahoot, Jeopardy and Socrative have been used for classroom learning. The use of technology generated the perception of positive student engagement. Quick-paced learning modules that utilize technology has continued to enforce that opinion. The rush to give students what they desire has caused faculty to create learning assignments very rapidly, leading to a lack of verified assessment tools. The unquestioning acceptance of technology as a learning enhancement tool has contributed to the high rate of integration for educational purposes. The importance of engaging students through the use of technology is one element to effective student learning; however, it is not the only element needed in the learning process. Student opinions of apparent value must be measured against the learning objectives to establish the actual worth of technology in nursing education.

The increased use of technology has amplified the screen-time exposure for students. Studies have found over the past decade, an increase in screen time has led to students reporting headaches and vision problems from working with technology (Montagni, Guichard, Carpenet, Tzourio, & Kurth, 2016). With six or more hours of computer or television screen time daily, Madhav, Sherchand, and Sherchan (2017) demonstrated through research that, adults have a

higher risk of being diagnosed with depression. With the research evidence identifying adverse student health complaints, there is a need to identify faculty tools or rubrics that could be used to measure the validity of learning. Having specific assessment tools for the process of technology learning is one way to add to the field of teaching and learning. By identifying the activities that are most successful in delivering student learning, there could be a reduction in student screen time. The reduction of screen time has the potential to prevent or decrease the physiological signs and symptoms being reported by students (Goodchild, 2018).

Additionally, verification of long-term memory being acquired through transfer from digital technology is of interest. Nursing students must use long-term memory and working memory for adequate and safe patient care actions. The assessment of students using information obtained through technology and then turning it into an experiential learning experience that can build their long-term memory caches will assist in helping the student to react to a critically changing patient situation (Garvey, 2015; Herron, 2018). Finding reliable tools and techniques to measure the long-term and working memory of students as they learn through using technology is the ambition of this research study.

Significance of the Study

Evaluating how the student responds without the use of the handheld digital device would demonstrate the impact on learning by digital acquisition. Tools to evaluate the transference of the newly gained knowledge into long-term memory storage and subsequently the retrieval of that learned data for working memory actions would complete Kolb's learning steps. Miller, Galanter, and Pribrum (1960) in their seminal work, stated working memory function is the portion of the brain used when a student is using organization action coupled with the physical performance of behaviors as a response to external events. Patient recovery outcomes are

dependent on the planning and action of the nursing student as they deliver therapies and patient care treatments. The students nursing care skills have been appraised throughout nursing school in the class, laboratory, and clinical. The long-term memory files needed for a nursing student is critical since they must promptly assess and react to the ever-changing patient condition by using stored information that is drawn into working memory. The information the student has obtained from handheld digital devices must be memorized, drilled, and mastered before it will become a deep-rooted data fact that is assimilated into long-term memory. The long-term memory facts then become information that can be pulled into the working memory during patient contact. Kolb's experiential learning phases (Kolb, 1984) needs to be present to develop that long-term memory cache, and each patient encounter experienced will add to the variances of experiences. Each subsequent variation offers additional long-term memory data facts that will add to a large foundation for the use in the nursing students' clinical reasoning actions (Van Graan, Williams, & Korn, 2016).

Research Question

The trend to utilize handheld digital devices is increasing in nursing education. To further the field of informatics in nursing education, a clear understanding of the tools and techniques used to assess the depth of learning is needed. Therefore, the research question used to establish a foundation for the research is as follows: How do nursing instructors evaluate Kolb's experiential learning theory (Kolb, 1984) with nursing students that are using handheld digital devices?

Definition of Terms

Associate Degree Nursing is a two-year nursing degree obtained at a community college (Kubec, 2017). This specific degree was established to decrease the nursing shortage in the early 1950s

Clinical pre-& post-conference nursing conferences are utilized to assist in bringing concepts from theory to the practice area for nursing students (Vezeau, 2016). With the use of Socratic questions, the students are cued through a discussion format meant to help students to use the application of the classroom theory on the very patients they have been providing care.

Handheld digital devices are devices that no agreed-upon terminology exists. For example; tablet computers and smartphones with internet capabilities have all been referred to as technology. Stec, Bauer, Hopgood, and Beery (2018) used the term tablet technology as well as offer the noted benefits expressed by students during tablet use for learning. Difficulty in identifying a specific name for these devices is compounded due to there being so many brands and sizes of mobile digital instruments as well as preferences of program operating systems.

High-fidelity manikins have been used for student learning in a controlled and structured setting provides the students with a safe way to transfer knowledge without risk to human patients (Alt-Gehrman, 2019). The manikins have highly sophisticated circuitry that allows for computer programs to control life-like functions.

Instant data search devices had been used to describe the combined internet web searching and use of mobile devices (Gavino, Ho, Wee, Marcelo, & Fontelo, 2013).

Learning management system (LMS) are web-based sites or internet clouds that provided a milieu for instructors to deliver and house student information such as course content, records, and grades (Cheng & Yuen, 2018).

Simulation Center (Sim) locations are laboratory center that holds manikins that are computer compatible and that have the ability to replicate many human functions and responses (Alt-Gehrman, 2019).

Working Memory, is the section of memory that is responsible for fluid intelligence. (Schwarb, Nail, & Schumacher, 2016). Needed memory to react to changing situation during an event.

Research Design

The methodology was a basic qualitative study. The basic qualitative research study described by Merriam and Tisdell (2016) has been used to interpret a person's experiences, to use participants' interviews to understand their perspective of the experience, and what their meaning of the experience is. When a researcher is looking for an in-depth understanding of an event, Neuman (2014) explained the best methodology of the study is qualitative design. The basic study design can be modified and lends itself for exploration, as noted by Kahlke (2014) it is also a robust framework for the novice researcher. For this study, interviews with specific interview questions will be used to elicit themes and words from nursing faculty participants. Researchers' observations of students using handheld devices and the steps observed in Kolb's experiential learning theory. This study used an exploratory study design using the nursing faculty's interviews for a deeper understanding of the influence on vertical learning in long-term memory with the use of handheld technology. For this study, knowledge of how the nursing faculty interprets and assesses the students during the learning process. Observation of Kolb's theory for learning will improve the practice of teaching with handheld technology.

Assumptions and Limitations

With the use of qualitative research, experiences of the researcher, the faculty members, and of the readers the data collected can create anticipated assumptions. This section will identify the perceived assumptions. An acknowledgement of limitation is included in this study to identify weaknesses that could impact the validity and alter the use of findings for the furtherance of nursing education research.

Assumptions

Several hypotheses have been identified as factors that could impact the credibility of the research. Theoretical assumptions are based on interviews of faculty experiences and the understanding that it is natural for the faculty to develop hypotheses or ideas of what type of products or tools helped the students to succeed during learning. An assumption noted was that the nursing faculty needed to be honest with their responses to the semi-structured interview questions (Kallio, Pietilä, Johnson, & Kangasniemi, 2016). Due to the perspective nature of qualitative research and open-ended questions, the hope that participants did not glean any bias from the interviewer was marginalized. The semi-structured questions were tested during a previous expert review on comparable inclusionary criteria faculty members for feedback. Additionally, this researcher allowed the faculty members to read the questions themselves to reduce any possible vocal cues.

An additional assumption was that the field observations were demonstrating an accurate representation of an authentic day to day class, lab, and clinical events for the faculty and students. An agreement to keep the environment as typical as possible was established with the participants before the scheduled observation (Langley & Klag, 2019). No special preparation was conducted and no instruction was given to alter the normal conduction of learning.

Limitations

Limitations of this research study included research conducted at a single site. With 13 participants, the study is limited to the experience of this small group of faculty members at that same location, while using the same products. Additional limitations of this study included areas intentionally not studied and design flaws that are inherent in the use of basic qualitative research.

Each participant interviewed related a unique perception of their experience creating an expected limitation. The nature of qualitative research uses the perspectives of the participants to establish an understanding of the researched practice. The difficulty is found when there is no specific way to provide proof of truth or reality with qualitative research objectively. Several techniques are used to decrease the inherent flaws, one strategy is known as triangulation, another is member checks, and a third well-known step is an adequate engagement in data collection (Merriam & Tisdell, 2016).

Triangulation uses two or three different sources of data collection. For a clear example, a comparison of information gleaned from personal interviews verified by internal documents. The member check is attained by enlisting feedback from the participants as the research interviews are being synthesized. Allowing the participants to view the transcription records of the interviews offers the participant the ability to validate what was said and to confirm the intended meaning. The final element is adequately spending time with the subject matter. The time spent must be used to examine the emerging themes and also examining any contrary themes.

Organization of the Remainder of the Study

Chapter 1 presented an introduction to handheld digital device usage in nursing education, detailed the background of nursing informatics, problem statement, overall purpose, and research

questions. Also described are the assumptions and limitations related to the study being examined. Chapter 2 contains a far-reaching review of the literature on handheld digital technology in nursing education, a theoretical framework of Kolb's experiential learning theory, data synthesis, and analysis of previous research methodology. Chapter 3 includes the methodology section and defines the organized process of collecting data to speak to the research problem adequately. Chapter 4 specifies an in-depth demonstration of the data analysis. Chapter 5 delivers the study summary and a discussion of the results and makes recommendations for future research studies.

CHAPTER 2. LITERATURE REVIEW

The placement of this literature review in the first section of this research study is necessary to demonstrate the vital need to further the research into assessment tools used by faculty members on students that are using technology for learning. A sizeable literature review provided the justification to continue the activities of this research project. Merriam and Tisdell (2016) instructed scholars to search the previous contributions of colleagues for augmentation to the current study. To obtain an understanding of the tools and techniques used by nursing faculty members that could evaluate student learning outcomes, a comprehensive background review of the literature was conducted. The overarching theme used was technology in undergraduate nursing education. An examination of the teaching and learning areas of the nursing programs where technology is used was also included.

The first relevant collection of topics searched produced a broad range that included studies of distant learning and social media for nurses. During the three years of development for this research, the focus was narrowed to examine mobile devices, integrations of technology in nursing, and evaluative tools used in the assessment of students using handheld digital devices. In the last two decades, nursing education has incorporated handheld digital device technology into the nursing learning curriculum (George & DeCristofaro, 2016).

Chapter 2 will be comprised of the methods used for this literature review search, the theory that provides a framework for the research study design, the articles for the reviewed literature, a critique of the research methods used for previous research, and a summary.

Methods of Searching

Six databases were accessed during the literature review of technology usage in nursing education programs. The databases were comprised of, Academic Search Premier, Cumulative Index of Nursing and Allied Health Literature (CINAHL) Ovid Nursing Full Text PLUS, ProQuest (a general and dissertation database) SAGE Research Methods, and Capella Library Summon search. The keywords used during the refined search included *nursing education*, *mobile devices*, *personal digital assistant*, *mLearning*, *digital learning*, *smartphone*, *mobile technology*, and *information and communication technology*, *eLearning*, and *eBooks*. Complicating a search using keywords is the inability to identify a common terminology for handheld mobile devices (O'Connor & Andrews, 2015).

The initial search using keywords digital technology in nursing education provided 117,974 articles of search-relevant sources. A substantial number of findings led to the deployment of limiting control features to narrow the focus field. The limit control features included; full-text peer-reviewed articles published in the last five years that were located in the discipline of nursing. The keywords of *mobile technology* with the search controls utilized yielded 1677 articles. The majority of the materials had a patient focus instead of the needed student nurse focus. The supplement of adding *nursing education* and making the requirement that the studies were scholarly and peer-reviewed produced 1325 articles. It became apparent that there was significant work devoted to mobile technology in nursing education. The vast majority of the pieces examined technology from the student perspective

The decision was made to limit the search time frame to the most recent five years of studies in an attempt to keep the article mining process manageable (Galvan, Galvan, & ProQuest Ebooks, 2017). Technology in nursing education has dramatically increased over the

last few decades, and the majority of the early articles focused on implementation into the nursing curriculum. In general, education has seen an impressive inflow of the application of technology used for teaching (Chang, Lai, & Hwang, 2018). Nursing programs were slower to bring technology into the methods for learning delivery. The extensive research conducted by Chang et al. (2018) found that while there were significant articles that provided information about technology in nursing education, there were few that address the evaluation of student learning.

Theoretical Orientation for the Study

An essential task for professional nursing faculty is the identification and development of personal teaching theory. The faculty usually built this philosophy by aligning educational theorists with the organizational, department, and program core values with personal values (Billings & Halstead, 2019; Yeom, Miller, & Delp, 2018). A teaching philosophy that is grounded in two educational theories, such as David Kolb and Malcolm Knowles, is not unusual for many faculty members. It was from these two theorists that this research project is guided.

David Kolb's (1984) experiential learning theory (ELT) was the first theory used in the formation of this study, and Knowles et al. (2015) adult learning theory was the second theory. Kolb's theory details the various learner styles as well as a learning cycle a student uses to obtain new knowledge. A solid grasp of adult learning theory is critical to nursing faculty since our students are entering the nursing school from their high school experience and are therefore considered adults. The adult learning theory (Knowles et al., 2015) provided the view of an adult learner having gained practical knowledge through years of living and how that experience influences the new teaching and learning occurrences. Additionally, the adult learner has pressures such as jobs, family, or scholarship obligations that also add to an element of student

expectation that the provided activities used for learning, should have meaning and a purpose as not to waste time (Knowles et al., 2015).

The framework of Kolb's theory of experiential learning (Kolb, 2015) directed this research on how a student is assessed for the learning process while using handheld digital technology in nursing education. An analysis of the nursing faculty members' interviews will be used to examine what tools were used to assess student learning, as well as all information that was related to their observations of the ELT cycle of Kolb's theory (Kolb, 2015).

Theory of experiential learning. David Kolb's theory of Experiential Learning (ELT) is a contemporary philosophy from the 1970s with a theoretical focus on how the brain learns (Kolb, 1984; Kolb & Kolb, 2005). Experiential learning theory provides support to this research through the theoretical premise that the learning process is acquired through four stages. The cycle of Kolb's four stages of experiential learning theory is demonstrated with participation in a live learning event, a reflection of that experience, abstract processing conceptualization, and active experimentation in a similar situation (Kolb, 1984).

Kolb devised his outline of learning by a hands-on methodology in the likeness of John Dewey's sentinel view that with previous learning occurrences, there is a deepening of the learning capacity from new stimuli (McCarthy, 2016). Additionally, Kolb incorporated similarities of Piaget's process of assimilation and accommodation, as to how the student perceives and then interprets a learning experience. The four-step learning cycle of ELT identified components labeled as concrete experience, reflection, conceptualization, and experimentation. The theory depicts the need for all four steps to be completed for learning to take place. The student will then need to progress through the stages of each learning experience. Although the student can enter the learning cycle at any point, there must be a systematic

progression through all four stages for a deep learning and long-term memory occurrence to be developed. ELT utilizes subjective individual experiences to form new knowledge understanding (Knowles et al., 2015; Shah et al., 2016).

A key element for successful transition through ELT is that the nursing student must be an active participant during the four-step learning process (Knowles et al., 2015; Kolb, 2015). The student cannot passively overhear information in a lecture or just be a casual observer during clinical. Activities for learning must be delivered in a hands-on and active modality. The initial learning experience occurs, the student processes the new learning, a time for contemplation the knowledge transpires, and finally, there is a transformation into long-term memory. The mind takes in the event then reflects, searches the mind for similar activities, makes sense of the new experience as it relates to old memories, and then forms an accommodation of the two events into the same mental file in the long-term memory (Kolb, 2015). For deep learning, students should be mentally present and physically active in the classroom, clinical, and skills lab (Knowles et al., 2015). This active involvement in the learning experience will allow for the nursing student to shift the learning events easily through the stages of ELT, known as; concrete experience, reflective observation, abstract conceptualization, and active experimentation (McCarthy, 2016).

Many research articles presented student perceptions of the use of technology for learning; however, the evidence available focused on faculty evaluation of learning is minimal (Beers & Berry, 2015; Day-Black & Merrill, 2015; Forehand et al., 2017; Gallegos & Nakashima, 2018). Examination of handheld digital technology in nursing education reveals a lack of studies related to faculty tools and techniques used to evaluate student learning. This research study offers an examination of the tools and techniques used by faculty members to

assess student learning and can improve the effectiveness of handheld digital device use throughout nursing education.

Theory of Andragogy. The term used to describe a child-learner education is pedagogy, and the name created for adult learners is andragogy (Knowles et al., 2015; Kolb, 1984). Pedagogy theory uses authoritarian directed teaching for the child-learner. The child learner enters into the phases of learning by the strict direction of the teachers. New concepts were delivered using passive methods such as lectures. The lecture imparts the information while the child-learner listens and takes in the data. Malcolm Knowles broke ground for adult education known as andragogy. Knowles's theory produced the opinion that adult learners do not learn through the same process as child learners. The term andragogy is the strategy of educating adult student learners in a self-directed fashion. The principle of adult learning theory is often the theory that is used in nursing education (Billings & Halstead, 2020).

The adult nursing student brings their life experiences and expectations to the learning environment. While the course content is new content for this adult learner, the hope is that the instructor will facilitate meaning to the teaching in an active way. New content must be meaningful and have elements of hands-on applications to be in line with the adult learner expectation (Knowles et al., 2015). The learning shifts from passive lecture to pre-class work that requires the student to be actively involved without direction (Young & Seibenhener, 2018). The pre-class activities were designed to deliver the content without taking away valuable active learning class time. If an adult learner fails to come to class prepared, they will struggle to participate in hands-on activities. Elements of Knowles adult education can be explained through the norms of the theoretical framework. Adults arrive for instruction with a need to know, the

sense of self-concept, range of experiences, readiness to learn, orientation to learning, and lastly, the students must be motivated to learn (Knowles et al., 2015).

Review of the Literature

The literature review included information about technology usage in schools of nursing, and about how faculty members evaluated the students for learning. Articles were obtained through the use of Capella University's library search tools for current and relevant research findings. All items reviewed and accepted were placed into topic folders labeled (a) technology in nursing, (b) tablets and handheld devices including smartphones, and (c) electronic textbooks in nursing programs. The literature reviewed yielded research on the integration of technology into nursing education and the findings that technology is becoming commonplace in nursing education not just as assistive tools, but also as an educational delivery method. However, currently, the use of the word technology has not been defined (Lee, Min, Oh, & Shim, 2018).

Technology has been used to describe equipment such as tablets, smartphones, and laptops. The word technology has also been used to describe the integration of e-books, e-Portfolio, and nursing applications into nursing education (Lai & Wu, 2016). Simulation equipment such as electronic manikins, augmented reality, and online education platforms known as learning management systems (LMS) were additional technology elements that have been scrutinized (Foronda et al., 2017). The studies analyzed displayed much of the research studies published have been focused on the perception of faculty members and students that are using various forms of technology in the three specific settings of nursing education class, skills laboratory, and clinical sites. The ease of technology usage, the costs incurred, and the contentment with the various types of technology has been scrutinized. While that contentment

was being considered, no examination of the quality of learning has occurred related to the use of these different technology approaches.

Clinical Expert and Classroom Management Roles. To work as a nursing faculty member, the nursing instructors must be proficient in the clinical setting for patient care, as well as in the classroom management for teaching. Nurse clinicians have a patient care focus that includes some teaching elements used to instruct patients about conditions and care. Many nurse clinicians are advanced practice nurses or have been practicing at the bedside, providing patient care. For the nurse that shifts to academic nurse educators, the level of course work directed for instruction in higher education is found to be minimal (Bullin, 2018; Fitzgerald, McNelis, & Billings, 2020). This lack of education has created a challenge for many nursing faculty members that were previously known to be experts in their specific field of nursing. The new faculty enter into academia with minimal training in things such as curriculum, evaluation methods, and course development.

To address the dual responsibility of clinical expert and nursing faculty member, the National League of Nursing (NLN) in 2005 developed core competencies that were designed to define the expectations of the nurse educator role. The NLN followed up its statement with a certification examination (Wittmann-Price, Godshall, & Wilson, 2017). While the core competencies are a recommendation, no formal regulation requires nursing faculty members to be trained in the essential coursework to develop the core competencies, and there is no requirement that nursing faculty take the national certification examination.

The lack of classroom management training can impact the development of effective student outcomes and student evaluations that include technology for learning. Nurse educators that have a decreased understanding of curriculum development tend to have an affinity to fall

back on teaching how they were taught (Baron, 2017). Without mentoring and proper training in the needed skills of academia, these faculty members might attempt to teach new nurses from the older scaffolding that did not include technology, which could lead to a weakness in the nursing program. The transition of technology into nursing education has created difficulty for some new and old nurses (Kotcherlakota, Kupzyk, & Rejda, 2017).

New faculty members who are not familiar with how to develop course curriculum and teaching plans, must learn to add the latest technology at the same time as learning the role of academic member. For the older nursing faculty members, there is the long-established course content that has already been used for instruction, leading some to resist the intrusion of technology due to the increased labor involved to modify their work to include the technology (Kotcherlakota, et al., 2017). The integration of any technology into nursing programs should have a significant purpose that is directly linked to student learning outcomes. The use of technology without evaluation of the appropriateness of learning outcomes is a waste of valuable learning clock hours. Assessment of student learning through the use of technology should also be addressed (Cabral & Baptista, 2019).

Holmes and Lindsay (2018) began research into what pedagogical foundation the use of technology is creating for nursing education. The question raised by these researchers was to understand the impression that by having technology, there is an assumed demand that it is to be used regardless of the need or justification. If there is a perceived faculty reluctance or resistance, then the member refusing to use the technology is considered nonadaptive or living behind the times. Homes and Lindsay again questioned if the student is learning the reflective elements needed in nursing education from work being done with the use of a computer. The study demonstrates there is a need to scrutinize technical knowledge against the human science

of caring. The practice of evaluative tools to measure the depth of student learning is missing from the research studies. This increased usage of digital and electronic educational methods has provoked the need for reliable and valid assessment tools that can be used to measure nursing student learning.

Postgraduate nurses are using computers, tablets, and smartphones for acute care nursing to look at the most current laboratory data as well as to communicate with other health care members. The use of electronics across health care and the increased societal reliance on handheld digital devices has been the driving force to incorporate technology into nursing school education. Informatics and technology enhanced learning (TEL) in nursing education is utilized in many areas of the curriculum for the class, skill laboratories, and clinical experiences. Technology is included in the LMS, which contains the course content online, the skills laboratory housing the high-fidelity simulators, and in the handheld digital devices that contain student textbooks. Through the use of electronic LMS, online lectures, discussion boards, and pre-class activities are assigned to prepare the student to participate in application activities facilitated in the classroom by faculty are known as flipped classroom. The workload and required effort for faculty were increased with the use of online education in comparison to the work required to deliver traditional classroom education (Judge & Murray, 2017).

After including technology into the curriculum, nursing students started accessing the technology from mobile devices. Nursing education has continued to increase the implementation of handheld digital devices within the class, laboratory, and clinical settings (Raman, 2015). Today's nursing student is using interactive course work that is being done online through the college LMS with the use of instructor developed virtual discussion groups and asynchronous activities. Submission of papers and the completion of quizzes were some of

the compelling ways technology has enhanced coursework (Chu et al., 2019). The intensified effort to incorporate technology is in an attempt to accommodate the technologically savvy nursing student and to keep them engaged. These digitally immersed students expect faculty members to integrate handheld digital devices into the curriculum and throughout the learning activities of the nursing program (Forehand et al., 2017).

Vogt and Schaffner (2016) researched the satisfaction of students using various types of learning delivery methods as well as an examination of the final grades produced. The instructional approaches included multiple kinds of technology as well as face to face instructions and involved the use of the same case study activity. A qualitative comparison was made to examine the students perceived satisfaction with the technology delivery method. Also, a blind study was conducted for an examination of the overall grade scores of the students. To perform the blind review for the examination, all student names were removed, and a rubric was used to alleviate subjectivity in grading. The researchers concluded there were little differences in grades results, and there was an increased need for research to concentrate in the area of assessment of the acquisition of learning through technology delivery methods (Vogt & Schaffner, 2016).

O'Connor and Andrews (2018) noted that nurse educators were tasked with the responsibility of identifying, planning, and instituting advanced technology within today's classroom to meet the changing demands of healthcare, assisting the student in transitioning from theory into practice readily. However, today's class demographic spans from one generation to another, creating a diverse learning group with varying proficiencies related to technology. Although O'Connor and Andrews's (2018) identified technology as an integrative tool and excellent clinician resource, the study was met with limitations (e.g., lack of equipment, et

cetera). The lack of pedagogical evidence to support the value-added effort of mobile device integration support the need for the study of how faculty are evaluating how much learning is being acquired with the use of digital handheld devices.

The division of nursing education is distributed into three areas of program educational clock hours for each course. The courses have minimum instructional hours assigned for the classroom, skills laboratory, and clinical site locations. The class hours are used for delivery of nursing theory, the skills laboratory is for practice in the psychomotor procedures, and the clinical sites are designated for the bedside application of nursing care. Each area has implemented the use of technology. The following is an examination of the articles reviewed about those areas.

Technology in the Classroom. The classroom environment carries specific faculty concerns being expressed in research by Gallegos and Nakashima (2018). Faculty member concerns were related to the observation of the student's being distracted by their handheld digital device. Many students used their computers and tablets to take notes or to follow along with course files during class. Still, even those students admit to straying unconsciously to personal use, according to the researchers. Gallegos and Nakashima's study has shown students access social media, online stores, sports updates, as well as text messaging features of their smartphones during class time.

Because of the generalized increased usage of technology, there can be an educator held perception that students' already possessed computer competency skills, which can lead to a delay in assisting students with technology challenges. A study conducted by Price et al., (2018) found that the student's ability to operate handheld digital device technology was not being measured before they were being required to use the designated device in the nursing programs.

During the first weeks of orientation to nursing school, many students had difficulty accessing their textbooks, additionally students reported examples of having a week to two weeks' delay in getting acclimated to the operation of the device. Unfortunately, some of these students were never able to recover from this delayed learning challenge (Price et al., 2018). Complicating the student's lack of computer ability is the instructor's difficulty in understanding the technology issues themselves. Gueval et al., (2015) found a barrier to technology troubleshooting measures for students faced with struggles was not being addressed by faculty due to a lack of ability as technicians. A lack of faculty training, coupled with the inability to provide students with technical support, complicated the integration and satisfaction of the student (Day-Black, 2015). An additional example of complications being faced was discovered when a student had experience with using a particular operating system and the nursing program's technology was not a harmonious product. Training for the student required additional time that had not been allocated and this extra training impacted valuable learning class time.

Tang and Barnett-Ellis (2017) researched current nursing students that were being trained to utilize handheld digital devices to access their textbooks for reading online and for the instantaneous search capabilities. The research conducted by student surveys uncovered that the student's comfort levels showed a direct relationship with the students' engagement in the learning. The study additionally supports the positive effect on student learning without an identified discussion of the usage of any type of assessment tool to gauge the acquisition of knowledge. The survey relied on perceptions of student participants of engagement to learning. Mennenga (2016) also studied the perception of the nursing student using digital textbooks in the classroom. Students answered questions related to their preference and study habits while using digital versus print textbooks. The second set of questions asks for the benefits of both types of

books. Students describe having the convenience of being able to study while attending their children's sporting competitions (Day-Black & Merrill, 2015). Researchers found the average student does not read a textbook source from title page to back cover, but instead only views the specific chapters assigned. Learners explained the method used to read the digital text was similar to how they read printed editions.

Additional findings presented were that some students preferred printed textbook copies over the digital versions, while some students are not given a choice and must purchase one or the other for use in the programs. Some programs enter into book bundle packages from publishers removing a student's choice from the process (Gueval et al., 2015). This program book bundle requirement can lead to the student paying twice for the same textbook if they prefer the opposite style. Additionally, Tang and Barnett-Ellis (2017) found many students purchased the print copy of the book to have at home for in-depth studying and would use the digital access for class, lab, and clinical for more effortless mobility as well as for on the go studies. Some students that purchased the print copy stated they had never opened their digital copies.

In most cases, instructors were given access to print copies of textbooks in addition to the digital copies free of charge. The research found the preponderance of instructors only used the printed version, while a smaller portion used a desktop computer to view the textbooks online (Tang & Barnett-Ellis, 2017). An even lower number of faculty did use the handheld digital devices for viewing of the course textbooks. A subgroup of faculty members that did use the digital textbook versions would often use a highlighting feature available in some of the digital products (Gueval et al., 2015). With a keystroke, the instructors could provide a way to share the

highlights with their students. A subscription code was assigned, which allowed the students to subscribe to their instructor's highlighted and tagged passages.

Interviews collected from students about the ease or complications of using technology in the nursing educational setting offered negative reviews when the device did not produce the expected results, which resulted in a delay in the students learning process and increase the mental workload for the student (Wu, Huang, Su, Chang, & Lu, 2018). Other students interviewed offered enthusiastic comments related to having the nursing textbooks at their fingertips and with the faster search field capabilities that make study time more mobile and efficient. The size and the weight of the print textbook copies needed for nursing school made it difficult for easy transport. The convenience of having digital editions on a lightweight handheld device reduced back strain for the student (Wu et al., 2018). None of the reviewed articles used tools to assess the student's success on examinations or quizzes after the usage of the electronic textbook over the printed version. No studies evaluated the overall improvement or decline of scores on testing as it relates to the different versions of the textbook the students were using.

Technology in the Clinical Skills Laboratory. There were a variety of technological examples used in the nursing skill laboratory, such as simulation manikins, video recording, online nursing applications, and social media formats (Watson, Cooke, & Walker, 2016). Computers are used to control the automated manikin responses as well as for the student to input data into bedside charts. Room cameras and iPads are used to video record students as they complete skills (Clark, Glazer, Edwards, & Pryse, 2017). The faculty member can then watch and evaluate the student. Additionally, the student can be given access to the recording to perform a self-assessment (Cernusca, Thompson, & Riggins, 2018). The simulation skills area of teaching has adapted to the use of technology with a greater sense of ease over the other areas of

nursing instruction. Simulation technology is becoming an integral part of the skills laboratory (Strand, Gulbrandsen, Slettebo, & Naden, 2017).

Simulation technology for the nursing skill lab is utilized to teach the psychomotor skills needed for clinical nursing. The intent of the skill lab has evolved into a safe preparatory location for students to experience simulated clinical cases without injury to human patients (Piryani et al., 2019). During the use of the sensory, motor, and cognitive learning processes, a student nurse can experience a detailed sequela of events as they proceed through patient care of a simulated patient manikin. With the use of technology, the manikin can provide instant feedback, such as a change to blood pressure after the administration of artificial medication injections. The modern-day manikin has the ability to be programmed to respond automatically or by a faculty controller. A faculty member from the control room is able to adjust the manikin's vitals, breath sounds, heart waves, and verbal responses to match the actions of the student's intervention. Simulation technology has provided nursing faculty with the ability to place a student in an environment that replicates the hospital arena. The student is instructed using scaffolding of learning from simple skills in foundational courses to increasingly complex skills in the capstone courses (Haraldseid, Friberg, & Aase, 2016; Kardong-Edgren, Oermann, & Rizzolo, 2019).

With the use of the simulated skills lab, the student has an increase of confidence in the ability to perform required skills on a patient in the hospital or extended care location. Through the use of audio and video recordings, the student has the chance to watch themselves as they perform the skills. The students express the nervousness that was produced when they first used this mode of training. That nervousness moved to an increased amount of confidence when they could see the success of specific parts of the experience. The students express a sense of safety with the process after the initial session. And by the following session, the student had learned to

use this as a learning tool. This reduction of stress has a positive effect on the student as well as improving patient outcomes and satisfaction (Boostel et al., 2018). The individual student was not the only one to benefit from the use of the video captured skill performances. Student peers could also see the videos and learn from the debriefing that occurs post scenario. Haraldseid et al. (2016) used students in a study to develop technology simulation activities for the course. The student was the driving force of what situation would be used for practice on the simulation patients.

Sundler, Pettersson, and Berglund (2015) used simulation as a way to examine a students' ability to perform clinical skills in a safe, controlled environment. The high-fidelity manikins provide a realistic and responsive patient situation that could evaluate student actions. The faculty found the examination of skills beneficial for the students' clinical placement. This examination was a pass-fail test, that offered an opportunity for critical thinking and an application of learned behaviors and skills. However, the researchers divulged that no investigation of learning from the simulation was conducted, only an examination of previously learned content was tested (Sundler et al., 2015).

Technology in the Clinical. One clinical concern expressed by faculty members was the potential of an unintentional release of patient records. Patient record protection initially was a concern that was present for postgraduate nurses to the extent that the United States Government implemented an act to protect privacy. The dissemination of private medical records of patients throughout the years led to the creation of a law known as the Health Insurance Portability and Accountability Act (HIPAA) of 1996 (U.S. Department of Health & Human Services, 2020). HIPAA protects the patient's records and information from being shared by health care providers to the general public.

Apprehension over digital device usage related to patient privacy issues became another issue with the release of social media applications such as Facebook. HIPAA violations occurred when health care providers used cellphones to post patient's personal identifying data or photographs to social media (McNally, Frey, & Crossan 2017). As a result of these significant violations, healthcare organizations now have policies and oversights related to the various application to protect themselves from patient litigation (Cho & Lee, 2016). Each nursing department enters into a legal contract with clinical sites to provide nursing education for students. The agreements include information related to the usage of computers that use inhouse hospital Intranet and external access to the Internet at the facility. Most nursing programs have developed a strict policy that prevents student nurses from using handheld devices in the clinical area of patient care (Billingsley & McKee, 2016). Many nursing faculty members continue to struggle with permitting nursing students to bring cellphones or tablets with cameras into clinical locations. The expressed concern is related to the fear of patient photographs being acquired and then being placed on social media platforms. Some nursing programs have allowed the usage of handheld devices with the use of a cover over the camera lens. Other forms of scrutiny for the device usage in the patient care area include clinical facilities that restrict the use of personal handheld digital devices to non-patient care areas only for both staff and students. Staff must leave personal cellphones or tablets in their lockers, and students have been limited to using school-approved devices only in breakrooms or the classroom teaching area of the facility (Billingsley & McKee, 2016).

Patients and faculty interpreted a students' dependence on the use of technology as a sign that the student did not possess the knowledge necessary for competent care. This perceived device dependence created a lack of trust and confidence. Patients and their families would see a

student using a handheld digital device and tend to believe the student was using social media applications, and not using the device for educational resources. Additional faculty concerns expressed in research by Gallegos and Nakashima (2018) were related to the observation of the student's being distracted by their handheld digital device. The described distraction was noted by several of the students, lending validation to the faculty members' concerns.

Student Memory Recall. How a student develops and uses recall of learned content requires a basic understanding of working memory, long-term memory, and recall (Buchin & Mulligan, 2019). Learning involves the retention of experienced data. Where the data is stored and how it is retrieved is seen through the work of neuroscientists. Memory has been categorized by long-term memory and working memory. Long-term memory is the storage location of all the information that is no longer needed by the working memory. Long-term memory has a limitless storage capacity (Bartsch, Singmann, & Oberauer, 2018). The area of long-term memory is the space that receives less attention since long-term memory facts are not continuously used unless needed by the working memory. Working memory is the cognitive element of behavior, actions, and critical thinking processes. The working memory is the powerhouse of cognition (Buchin & Mulligan, 2019). The need to have the long-term stored data available for recall by the working memory is essential to normal daily cognitive function. The simple act of recalling a password utilizes the recall of data to be delivered to working memory from long-term memory. The password is not needed for immediate actions, so it is stored in the long-term memory to free up the limited storage capacity of working memory. It is through a refreshing process that retrieval of episodic long-term memory is brought forward for use by working memory, this refreshing process was also found to solidify the memory in the long-term storage (Bartsch et al., 2018; Loaiza & Halse, 2019).

Fairhurst, Scott, and Deroy (2017) researched a multisensory learning process for an enhanced recall of learned data. By presenting new information in two different but matching ways to the working memory, the student was able to retain the data more efficiently. The researchers used audio-visual matching to help with this study of recall. The research presented transferable inferences that could be used for educational purposes. Bartsch et al. (2018) discussed the possibility that when a memory is brought into focus or refreshed after it has been placed in long-term memory, there is an increased depth of the memory. The effect of elaboration whereby the use of imagery deeply encoded the data as did the use of stringing of connection to other similar memories helped to enhance the memory greatly, and the recall, when needed by working memory, was described by Bartsch et al. (2018). The process using examination to review learned material from the long-term memory enhanced the memory as well as enforced subsequent recall. The act of repeated retrieval of data from the long-term memory created an increased level of memory (Buchin & Mulligan, 2019). All of the studies reviewed provide evidence that with repeated exposure and recall of learned material, the level of learning was deeper. The use of refresh and recall has the potential to boost memory as it is placed into the student's long-term memory.

Synthesis of the Research Findings

The literature review conducted for this research project yielded research on the integration of technology into nursing education and findings that technology is becoming commonplace in nursing education not just as assistive tools, but also as an educational delivery method (Chang et al., 2018; Clark et al., 2017; Forehand et al., 2017). However, the use of the word technology has not been defined. The term technology was found to be used interchangeably for several different things. The word technology was used to describe

equipment such as tablets, smartphones, and laptops. It was also used to describe the integration of e-books and nursing applications were two of the elements that have been researched. Simulation equipment and online education are two additional elements that have been placed in the technology terminology. The relevant literature reviewed displayed much of the research studies have been focused on the popularity of various forms of technology being utilized by students.

Faculty concerns connected to student use of technology was also found in the studies compiled for review. These concerns are felt in the classroom and clinical area most often (Alsayed et al., 2019; Billingsley & McKee, 2016). Commonly discussed faculty concerns were of the student publicly identifying a patient's medical information, or the temptation of distraction that is present with the use of the Internet and social media applications (Day-Black & Merrill, 2015). Concerns related to faculty use of technology was revolved around the lack of training for faculty on the procedure of technology usage, as well as difficulty for faculty to assist students that encounter technical problems. Increased training sessions was recommended to assist in decreasing the apprehensiveness expressed by faculty in several of the articles reviewed for this study (Day-Black & Merrill, 2015).

Several articles continue to discuss the importance of faculty incorporating the use of technology to enhance higher-level student learning. Faculty members should find the needed expert resources on campus that can assist with the design and development of technology-infused activities that will stimulate critical thinking in nursing students. The need to assess the learning that technology plays with the newly developed activities was debated in this study, however, no process is explained as to how technology will be examined or evaluated (Skiba, 2017; Vogt & Schaffner, 2016).

Chang et al. (2018) in a meta-review of relevant literature, indicated that while there were various studies dedicated to mobile learning, there was specifically a glaring lack of investigations into the subject of student learning that was taking place with the use of mobile technology. Another concern developed from this extensive analysis was the apprehension of the speed at which the nursing curriculum implemented technology. Interestingly, many nursing educators are implementing mobile technology to increase the success of student learning outcomes. However, there is a gap in the assessment of student learning that is taking place.

The reviewed articles commonly supported the opinion that with the integration of technology into nursing education, there was a positive student perception (Gallegos & Nakashima, 2018; George & DeCristofaro, 2016; Gueval et al., 2015; Haraldseid, Friberg, & Aase, 2015). This student perception provides the nursing faculty with a chance to create meaningful student engagement enhancements to their curriculum design through distant learning opportunities and development of pre-class assignments that will increase the efficiency of in-class activities. The increased usage of digital or electronic education methods has provoked the need for the development of reliable and valid assessment tools that can be used to judge student learning with the use of technology. The practice of evaluation tools to measure the depth of student learning lacks appraisal in research studies. There is a lack of scholarly research that examines the process faculty members were taking to assess the effectiveness of learning through the use of technology (Vogt & Schaffner, 2016). Effectiveness of learning outcomes and student engagement should not be considered the same worth for educational purposes.

Critique of Previous Research Methods

The research studies reviewed related to technology in nursing education included quantitative, qualitative, and mixed methods of design. The most frequently used study method

was qualitative. This method primarily provided the perceptions of the students' lens and less often from a faculty member's perspective. The topic of technology usage in education mostly involved comfort levels of faculty and students, which was best acquired with the use of qualitative methods such as questionnaires, surveys, interviews, and focused groups. The majority of articles found the students welcomed and expected the use of technology for teaching and learning.

Day-Black and Merrill (2015) researched the initial introduction of technology and the use of certain types of mobile devices for senior class nursing students. Student surveys were used at the beginning, midpoint, and at the conclusion of the study to obtain information about the perceived enhancement to student learning in psychiatric-mental health clinical. After a short time for students to learn the device and application, students began to find the practical use of the mobile device as positive. Additional information obtained from the Day-Black and Merrill pilot study were used to form decisions of inclusion of mobile devices into other clinical areas and possible for nursing research. The follow-up appeal from this research asks for continued research into deciding on specific types of devices, placing textbooks on the devices, and best practice to get faculty to include the devices into their curriculum. There was no dialogue of the validation for learning that took place with the device usage (Day-Black & Merrill, Fall 2015).

Forehand, et al. (2017) reported that nursing faculty had created a pre-class simulation that was delivered by mobile technology. This simulation activity had a faculty developed self-assessment quiz attached for the student to assess their learning. According to Forehand et al., student satisfaction with the mobile delivery of the content was recorded by all 84 students in the class. Again, this assessment was derived from perceptions of how students liked the delivery

method of the content and not about how well the student learned the material or recalled that content for evaluation purposes.

Several articles discussed the concern over distractions from having handheld technology in class. A study by Gallegos and Nakashima (2018) researched the use of a technology that would allow the faculty to take over the control of the student handheld devices and not let students to stray to off-topic sites. This same study by Gallegos and Nakashima found that of the 85 students that responded, 65% left smartphone notifications on all the time, including time in class. In an additional study, Day-Black and Merrill (2015) stated that even with the distraction created by technology, a handheld device could be a valuable tool for student engagement.

An article by Smart, Ross, Carollo, and Williams-Gilbert (2020) questioned the depth of learning that occurs with the use of technology and calls for educators to continue to examine the benefits of the use. Another research article by Alsayed et al. (2019) used a cross-sectional survey to assess the usage of smartphones of undergraduates. The evidence provided shows the use of smartphones is found to be increasing in all areas of life. The observed increased usage has generated a need to study and develop ways for educators to begin assessing and evaluating the learning process among nursing students that are using mobile devices.

The limitations designated from the observed studies included small sampling and single-site usage (Gallegos & Nakashima, 2018; Vogt & Schaffner, 2016). The small sample usage and the single-site studies produced concern for transferability and replication of the study in a broader study scope. One cross-sectional study (Alsayed et al., 2019) was conducted at a single site as well as an additional limitation of a small sample size, the demographic was all female, and the data was all self-reported. Chuang, Lai, Chang, and Wan (2018) reported concern of contamination of participants was noted in a study that used all students from the same class.

Minimal restraints were used to avoid the sharing of information, but the researchers were concerned due to the close contact the participants had (Chuang et al., 2018). And an additional limitation stated from research by Cernusca et al., (2018) was the technical weaknesses of students having an impact on the results of the study. Haraldseid et al., (2015) utilized a single research site for the focus group designed research causing the researchers to wonder if the results reflected the individual participant's feelings or if the group consensus muted the results.

Strengths identified from the literature review articles found that technology is being used in nursing programs at an increasing rate. The incorporation of technology into the nursing curriculum is producing a perception of student engagement and is shown to increase student confidence. The use of technology in the simulation laboratory has provided a decrease of stress associated with the student performance of skills (Boostel et al., 2018). Faculty members continue to develop and find new and innovative ways to include technology into the nursing curriculum.

Key findings from the research establish the student engagement impact as well as evidence of convenience of having all textbooks and nursing application products in a lightweight device was the most agreed on advantage (Gueval et al., 2015). While these key findings are important to student approval, the need to balance the desires of students with the effectiveness of teaching and learning is critical. However, all of the literature that was reviewed provided this study with affirmation that research is needed into the tools and techniques used for assessment of students. The one article that provided a self-assessment of learning for the student did not offer data that support tools or techniques that assess the depth of learning that occurred with the use of handheld digital devices (Vogt & Schaffner, 2016).

By investigating several research design methods, a significant level of insight into what information was available related to technology in nursing was observed. The qualitative study is found to be the most useful method of obtaining information related to the usage and preferences of uses of technology. The use of technology is a personal journey, and the use of qualitative design offers the individualization of meaning to the process (Patton, 2015). Due to the primary question of this study being a query of faculty behaviors related to the assessment of students, the selection of qualitative was used for data collection.

Summary

As described in this chapter's literature review, multiple studies have shown the use of technology in the three areas of nursing education. Much of the collected information is demonstrated from the students' view. Research examples have demonstrated the student has a positive perception of the enhancement of student engagement. The student feels more connected to the faculty and the content. Other positive student views are related to student confidence, to the increased convenience, and to the ability to have instant access to their learning content and resources (Haraldseid et al., 2015; Sundler et al., 2015; Gallegos, & Nakashima, 2018; Cernusca et al., 2018).

Some nursing educators have been reluctant to include handheld digital devices into the class, laboratory, and clinical for the reasons provided in the review of the literature. The reluctance included the concerns of security of patient information and student distraction issues. While some educators continue to hold reluctance, other instructors have embraced the use of technology for curriculum design applications (Kotcherlakota et at., 2017).

While the evidence provided by the researchers of the literature, the review shows advantages with the use of handheld digital devices for nursing students. A gap is appreciated in

the assessment process used to verify student learning. The focus of this research study is directed toward tools or techniques faculty members used to assess student learning from the use of handheld digital devices. The use of specific applications or electronic products the handheld digital devices contained was not included for evaluation in the study. Neither was the observation of how the student viewed the use of handheld digital devices or products for learning. Only two articles concentrated on assessment of the student learning taking place and of what tools were being used for that assessment (Sundler et al., 2015; Vogt & Schaffner, 2016).

In Chapter 3, a description will be provided of the methodology used to obtain discernment into how faculty members were assessing nursing students that use handheld digital devices for learning. The following chapter will give a review of the purpose of the study, the research question used, and the research design. Chapter 3 will conclude with information related to the population chosen, sample procedures, data analysis, and ethical considerations used.

CHAPTER 3. METHODOLOGY

Chapter 2 provided the literature review with a summation of results that produced the relevant research studies focused on technology in nursing education. An introduction was presented to the theorist that provided a theoretical orientation as well as critiques of the previous research methods. The evidence portrayed the advantage for student use of technology in nursing education to be related to student engagement but confirmed a lack of verification of the use of evaluation tools by faculty members was demonstrated.

Chapter 3 will provide a detailed layout of the methodology used to conduct the research used in this study. The specific elements of the process used include the purpose of the study, the research question with the questions used for participant interviews, and the research design. Additional details include the target population and samples involved, procedures followed throughout the data collection process, explanation of the data analysis process, and the instruments used for analysis. A conclusion to the methods described in Chapter 3 will provide the ethical considerations applied to the research study. The final entry for this chapter will be the summary of the main points.

Purpose of the Study

Chapter 1 described the elements of a basic qualitative research design and how the research questions appropriately aligned with the criteria for that basic research design. A background review was provided to describe the purpose of the study. The explained purpose demonstrated why there was a need to ask faculty members about their use of tools and

techniques for assessment of student learning through the use of technology. Chang et al. (2018) researched the heavily increasing position that technology is taking in the education of nursing students. However, there remains a significant lack of research directed at the evaluation of student learning. The concern related to the use of technology without assessment for its effectiveness or purpose was included as one of the final summations in research conducted by Cabral and Baptista (2019).

The demand to provide students with engagement was a central focus of educators as they included the various types of technology. Reviewed articles from Chapter 2, demonstrated research related to positive engagement aspects of technology from the student's perception (Boostel et al., 2018; Tang & Barnett-Ellis, 2017). The need to engage adult student-learners in active learning and the increased usage of technology to accomplish this active learning has been demonstrated by several researchers (Chicca & Shellenbarger, 2018; Holmes & Lindsay, 2018; Kolb, 1984). Nursing students are encountering technology in education without the means to reflect on the learning that is taking place. Without the proper time to process or assimilate the new knowledge, Holmes and Lindsay questioned if there was deep student learning occurring. The tools to evaluate the use of technology is the question leading this research study.

The research study was conducted to explore faculty member's use of tools of evaluation for technology during the student learning process. A basic qualitative design was useful to examine processes and procedures to gain better insight. The purposefulness of the study is to assist other nursing faculty members in discovering and developing standard tools and techniques to be used for the evaluation of technology-based learning activities. Additionally, the study's purpose is to prevent nursing curriculum from adding technology without supportive

assessment evidence into how learning is occurring with technology and of how well the instruction is being solidified into student memory recall.

Research Question

The primary research question is, how do nursing instructors evaluate Kolb's experiential learning theory (Kolb, 1984) with nursing students using handheld digital devices?

Research Design

The basic qualitative research study described by Merriam and Tisdell (2016) is used to interpret a person's experiences through the use of interviews and field notes. The researcher determined a basic qualitative research design was the proper design to answer the research question. The research question, how do nursing faculty measure the learning process of nursing students that are using technology, required a review of the individual participant's perceptions. The study tracked how instant data searches during student learning was being evaluated by nursing faculty during class, laboratory, and clinical activities. An additional question was the evaluation of students needing to search for the same data during a subsequent experience repeatedly. A compilation of faculty member's observations and recollections would be required to answer the research question. The researcher established the qualitative research design process through the use of faculty member interviews and a collection of researcher field notes.

Target Population and Sample

This section examined the population and sampling techniques used for the research study. The general population for this study was nursing faculty members that work in a college. A purposeful sampling method was used to yield participants that met the sample requirements. The development of requirements for the target population and sampling inclusions used will be described in detail in this section.

Population

The targeted population for the research study included full-time tenure track faculty members of a Midwest community college nursing program. Teaching responsibilities of the faculty population included class, laboratory, and clinical times where there was a use of technology and handheld digital devices in use by students. Initially cited for the inclusion of the population of the study were instructors that taught first-year students. The faculty members in this nursing program held the responsibility of instruction to all levels of nursing students throughout the studies designated learning areas of the nursing program. It was reasonable to include all faculty members that also taught second-year education if those same instructors also taught the intended first-year students.

Sample

The number of samples were to be determined by the number of faculty members that match the defined inclusion criteria. No specific number of participants were required for this study due to the qualitative nature of the survey with perceptions and experiences being observed; however, a minimum of 12 participants was the benchmark designated in the initial planning. The number of participants should be large enough to provide adequate collection and to validate the researcher's question aim, according to Malterud, Siersma, and Guassora (2016). Therefore, it was critical after each interview to analyze the transcripts for underdeveloped themes that would indicate a lack of saturation. The weakness of themes would necessitate the need for additional participants.

The inclusion characteristics of the participant were six to 12, full-time faculty members of an Associate Degree Nursing Program that teach first-year student nurses, class, laboratory, and clinical. Faculty members that had attained academic ranking of assistant professors,

associate professors, and full professors were included, as well as those faculty members that had observation of students in all three areas of learning. Because the researcher was explicitly looking for nursing faculty members teaching students using technology and handheld mobile devices for the study, this made this process a purposeful, nonprobability sample (Merriam & Tisdale, 2016). The established exclusion criteria specified no part-time clinical faculty members would be used. Also excluded were laboratory faculty that did not participate in teaching outside of the laboratory setting.

Procedures

The procedures used during the research activities will be described in this portion of the chapter. Elements of the research procedures include; the participant selection process, protections used for the participants, and the methods used during the collection of data. Additional procedures used for the analysis of the data were the instruments and the role of the researcher. And of great significance, the ethical considerations related to the research will be clarified.

Participant Selection

Concluding formal IRB approval by Capella and the research site, participant recruitment began. An email introduction describing the study, the purpose of the study, criteria for eligibility inclusion and exclusion requirements, and a flyer was sent to the chair of the nursing program contained within the departments of the Midwestern community college. The nursing chairperson forwarded the introduction, prescreening survey, and flyer to all faculty members in the school of nursing. The participants responded through email with a declaration of willingness to participate.

Prescreening of participants occurred with attention to inclusion and exclusion criteria. A survey response form with screening questions was emailed during the initial introduction of the study. Once the survey was returned, an evaluation of the survey forms conducted, and then a follow-up email returned to establish an agreement for participation. Once informed consent and approval of the interview schedule were determined, the interviews were scheduled.

Survey questions:

- Are you a full-time tenure-track faculty member?
- Do you participate in teaching foundations in Nursing?
- Is your teaching done in the classroom, laboratory, and clinical?
- Do your students use handheld mobile technology in all areas of teaching?

Protection of Participants

Protection and confidentiality were reviewed continuously throughout the study. The researcher developed a dedicated research study Gmail address to keep all documents and correspondence separate from other emails. The use of a personal cell phone that was only accessed by the researcher was used for additional communication protections. All identifying characteristics were removed from the participants communication.

After the potential participant initial reply were received, a focused review of individual eligibility was conducted. A detailed examination to confirm the participant met the acceptable sampling criteria. Permission was obtained to send the written informed consent form to each eligible participant for review through a preferred email. The participant had the opportunity to review this consent form and to consult with others for seven days before scheduling an interview date and time. The researcher provided participants with multiple methods of contact arraignment to allow for discussion related to the informed consent as well as allowing for

questions pertaining to the involved in the study. The study was conducted in a Midwest community college that the researcher was not affiliated with professionally or personally.

No harm was foreseen with this study to the participants. All expected requirements of participants were explained using open and honest communication. The information about the objectives and processes that would be used were provided to each participant. The ethical considerations for this study involved a clear and concise informed consent, the consent was explained in detail related to the purpose of the research, provided a complete description of the right to cease participation from the study with no repercussions, and finally an assurance that no anticipated real or perceived harm would develop from participation (Belmont Report, 1979).

No vulnerable participants were utilized. The questions were asked and answered by full-time faculty members facilitating learning in the classroom, skills laboratory, and clinical. There was minimal to null risk to the study participants. The researcher demonstrated respect for the participants' feelings, confidentiality, and protection from harm. A professional manner was used during interviews and while in the observational environment. The research study data was scrutinized for validity by expert review, field testing, and member checks. All of these steps ensured the researcher had not inserted bias during the lengthy process. Transparency was maintained throughout the entire research process (Merriam & Tisdell, 2016).

Before conducting the scheduled interviews face-to-face, the informed consent and the risk potential were again reviewed, allowing the participant to voice willingness to participate. The informed consent was signed and designated a unique identification number that was assigned to each interview based on the chronological order of the interview schedule. A master list was created on a paper document that was placed in a sealed envelope and located in a locked cabinet in the researcher's private office. All identifiable information obtained during the

interview process was deleted to protect identities and to maintain confidentiality. The researcher transcribed the text of the audio recordings captured during the face-to-face interviews within 24 hours of the conversation.

Expert Review. Before IRB approval was obtained, an expert review was conducted. The expert review team involved three volunteers that are experts in the field. The volunteers received the interview questions for review. All three volunteers were full-time faculty members that teach in a community college nursing program that utilizes technology and handheld digital devices. Each field tester offered feedback and advice related to the quality and appropriateness of questions for the ability to obtain the sought data responses. With the use of the input provided from the expert review team, the interview questions were modified to clarify ambiguous terms and to remove colloquial verbiage.

Data Collection

After being identified as a match to the inclusion criteria, the interviews were arranged. The interviews were scheduled over four days at various times to accommodate teaching schedules. Because the researcher was not local, the prospective participants utilized email and the private cell phone number provided for questions and concerns.

The research site provided privacy with the use of secluded office space. Time was allotted before the formal interview began for review of the informed consent, and to discuss any questions or concerns. The participants were informed of the use of an audio recorder for accuracy for the subsequent transcription process. The meetings followed a semi-structured question process using the printed guided questions that had been approved during the IRB process. The participants were instructed to individually read the questions being used so that the researcher's manner and tone did not interfere with the responses being provided. No written

field notes were taken during the interview process to eliminate contributor distractions. The face-to-face audio-recorded interviews were conducted with participants during a typical workday.

Each interview lasted between 20 to 45 minutes. The researcher prompted a final follow-up question asking if there was anything else that they wish to add to the interview. After the interview, the recording was stopped, the content was preserved on the recorder's password-protected storage file. The storage file was then downloaded into a pass-coded folder on the researcher's computer at the end of each day. The recorder storage file that contained the audio recording was placed into a locked cabinet in the researcher's office. The transcriptions, once individually completed, were stored on the password-protected computer with a backup copy placed on a detachable flash-drive. The flash-drive was placed in a locked cabinet in the researcher's office, along with the field notes taken during observations of simulation laboratory and clinical. These protected data samples will remain secure for seven years from the publication date and at the end of that time will be deleted from the computer using computer scrubbing software and destroyed or shredded as appropriate.

Scheduled Observations. In between interview schedules, the researcher had observation opportunities. The observations included foundation class, advanced foundations class, advanced foundation simulation laboratory, and clinical site post-conference. An honest attempt was made by the researcher to reduce any disruption of the normal flow of the observational field of study. No conversations or observations of the students were conducted. Only the actions and interaction of the faculty members were viewed as the primary queries of study.

Data Analysis

The steps of data collection and analysis occurred at the same time. By doing the collection and analysis processes concurrently, information would remain organized, manageable, and easily recalled from the researcher's memory (Merriam & Tisdell, 2016). While there are multiple sources for data analysis commercially, the researcher committed to processing the data by hand. The only products used were Microsoft Word for Mac ® and Excel®. The steps taken for analysis of the interviews were the same process used for all field notes obtained from the observational experiences.

Construction of data. Shortly after the initial interview and observation experience, the researcher manually transcribed the audio recordings and notes to a word document. Each of the audio recordings and the handwritten field notes were meticulously transcribe for accuracy. The interviews and field notes had a designated file, and each was placed in a passcode-protected file on the computer. A copy of the text was printed for use in the handwritten notational process of highlighting, underlining, and symbol assignment during the read-through process. The transcription and notes were read-through the first time without markings or notations being drawn. During the second read through, notes were written, and underlines placed on the document and symbols used for phrases. After the second interview and field notes were collected each were transcribed, printed, and were read and reread for a comparison to the first transcriptions. The process used was followed to identify any common words or phrases. The open coding method continued with each of the transcribed interviews to look for the coding keywords or phrases or to identify the emergence of any new patterns. This process was used for all of the subsequent interviews and field notes for establishment of category construction. The use of underlining, multiple highlighters, and designated symbols were used during this initial

analysis. This process of data analysis during this phase was inductive. The researcher was looking for any common keywords or phrases.

Sorting categories and data. Use of the search function in Microsoft Word for Mac and the companion program Excel, a spreadsheet and transcription document were created. The Word document allowed for printing of the transcriptions for the use of a manual notation process. Once categories and data points had developed into identified patterns, the spreadsheet was utilized to assign recognized commonalities to the evolving categories. The interviews and field notes were reread for refinement of the categories and development of themes that were emerging. This phase began the deductive reasoning phase. The researcher continued to look for additional evidence that supports the categories developed.

Naming the categories. The researcher reviewed the numerous categories and compared the conceptual meaning of the collective data pieces as it related to the research question. The names that were assigned held significance to the participants as well as to the research question. The need to reduce the number of categories was done to assist the researcher to further narrow the focus. The reduced categories were again narrowed to identify specific themes that would assist in answering the research questions.

Instruments

The tools and instruments used in the data collection and analysis of this qualitative research will be examined in this portion of chapter three. The role of the researcher and the four semi-structured guiding interview questions used to elicit the research data were tools used in the study. The observation of participants in the class, simulation laboratory, and clinical post-conference field notes also provided the researcher with data points. An additional tool used

during the interviews was an audio recorder with a storage file, and Microsoft Word Mac® and Excel®.

The Role of the Researcher

The role taken by the researcher was that of an instrument of a data collector during the interviews (Merriam & Tisdell, 2016). Proper manners, and a polite, casual conversational style assisted the researcher in developing an open environment for the discussion. The interview room provided comfortable office chairs that appeared in identical height with each other to avoid a dominance perception. The room temperature was compatible with the season, and there was no glass window views that would distract participants or allow others to view into the room and view what was taking place in the interview.

The technique used to deliver the questions for the interview was done to allow the participant to hold a copy of the research questions and to consider the questions before they began to answer. The researcher provided clarification for any difficulties encountered during the interview but the majority of the interview time was provided from the participant's voice. During the field experiences, the action was that of an observer. The researcher remained a passive witness to prevent any alteration of the natural movements of the participants.

Guiding Interview Questions

The researcher developed the open-ended guided questions to obtain the participants' perception of student learning and to the tools that were used to evaluate student learning through the use of technology. The questions were developed for this research to prompt participants for observations of the four-step process used for Kolb's ELT. The guiding interview questions were used to facilitate an open dialogue with the study participants. The expert review that was conducted by volunteer testers helped to refine the questions to ensure the contributor

would have a clear understanding of the questions and to assist with obtaining a rich depth of data from the perceptions of the participants. The use of open-ended questions was used to discourage yes and no responses. The questions used included the following:

1. Will you portray your observation from clinical, class, or lab, with a student that is required to retrieve information from their long-term memory recall for real-time patient action?
2. Follow up: Do you use any tools or techniques to assess the student's retention of the data that was obtained from the use of their handheld digital device?
3. Could you illuminate your experience with students utilizing their tablets in the clinical area to obtain data?
4. Follow up: What is your observation of that experience? Describe them using instruments that would assist with memory retention of the searched data. Examples: Instruments or tools such as Writing information down on flashcards or notebooks, using verbal connections to tie this data to other facts known or saving in their favorites on the tablets for retrieval later.
5. Can you describe a time during clinical class or lab that you experienced a student that had retrieved electronic data, and when faced with needing the data at a later time, describe if they were able to recall the previous information or was an additional search needed?
6. During clinical class, lab experience, please depict a time as a faculty member that you used pop quizzes or Socratic questioning to identify cognitively stored student data that had been electronically retrieved from their tablet on a prior occurrence?

Questions used to elicit more in-depth dialogue included the following:

7. Could you offer an example?
8. Could you describe a specific time?

The only additional questions used was at the conclusion of the interviews, the researcher asked each participant if they had any other information they wanted to add. As one interview was concluding and the recorder was turned off, the participant said they discovered she had more to add. This contributor declaration triggered the formal interview to be restarted.

Ethical Considerations

Much of this chapter has outlined the ethical steps taken to ensure the validity and reliability of the investigation. The evidence of ethics was established with the IRB approved contract that was examined by both the Capella University review board and the research site Midwestern Community College review board. The approval was after a complete examination of the exact process to be used for the research, and inspection of the protections accepted for study participants. IRB approval included documented several assurances of the researcher:

1. The researcher certifies that the information provided on and attached to this form is complete and accurate.
2. The researcher agrees to provide proper surveillance of this project to ensure the rights and welfare of human subjects are protected and will report any problems to the IRB.
3. The researcher agrees that modifications to an approved project will not take place without prior review and approval by the IRB.
4. The researcher agrees the research will not take place without the receipt of permission from any cooperating institutions, when applicable.
5. The researcher agrees to obtain approval from other appropriate committees as needed for this project.

6. The researcher understands that IRB approval of this project does not grant access to any facilities, materials, or data on which this project may depend. Such access must be granted by the unit with relevant custodial authority.
7. The researcher agrees that all activities related to this project will be performed in accordance with all applicable federal, state, and local laws and regulations, and the Midwest Community College policies and procedures.
8. The researcher understands that the project cannot involve human subjects without explicit IRB exempt designation or approval.
9. The researcher agrees that the IRB can access project activities, records, and materials as it deems necessary to monitor the proposed project for compliance.

Participant protection such as the privacy and confidentiality measures included the activations of a separate email address and use of the personal cell phone. Providing the potential participant with the informed consent form well in advance of any scheduled interview was done to ensure that the participant had a significant opportunity to think about any consequences that might be experienced real or perceived. The researcher demonstrated availability for questions and concerns before and throughout the study to provide participant access. The assignment of secured participant codes was used to remove all identifying characteristics of the contributors to maintain confidentiality.

No compensation or promises were made for agreeing to be interviewed. Additionally, no coercion was used to influence the participants. The study posed minimal to null risks. The contributors were advised through written and verbal instruction that there was no reciprocity for participation, and additionally, no assurances were given to persuade participants to be involved. Transferability and dependability are additional ethical considerations examined in this study.

One way used to provide transferability was the accurate transcription of the data samples would provide a clear study recipe for other researchers to use in furtherance of the resulted study. The collected data was stored in password-protected files and electronic folders. The audio storage drive and the recording device was not used before the study and after use was placed into a locked filing cabinet in the researcher's private office. After the required seven years, the researcher would use commercial products that electronically remove and destroy all files that were used for the storage of research study material. A home shredder would be used to shred all documents related to the study.

Of critical importance to the respectability of the study is the evaluation of the researcher's aims. In particular, attention to personal bias and adherence to the IRB proposed procedures relied on the individual integrity displayed for the science of research by the researcher. Assurance of participants confidentiality and the protection of the acquired data was maintained through the entire process. Accurate transcription of the interviews and the dissemination of the information is additional researcher concerns that were done to promote the credibility of the data.

Summary

The basic qualitative study design was supported with the evidence from data collection tools of interviews and field notes obtained during observation. The research design aligned with the research question of how do nursing instructors evaluate Kolb's experiential learning theory (Kolb, 1984) with nursing students using handheld digital devices. The questions required faculty to discuss recollections of watching students during activities that required the use of technology for learning. The recruitment of participants required prescreening and inclusion and exclusion guidelines. The study participants answered four semi-structured interview questions

and had the opportunity to review the transcription for accuracy. The data files were password protected for safekeeping, and the storage files, folders, audio recorder files, and paper documents were kept secure in a locked file cabinet. The themes from the collected data samples were coded and placed into categories and themes for evidence of saturation to the research question.

The information provided in the chapter was delivered to offer a clear picture of the methods used to conduct the research. The collection of data was not a singular event, but a process, and all parts of that process demonstrated ethical rigor. It was with a principled study that other educators and additional researchers can advance the educational field related to the assessment of technology in nursing education. Additional aspects covered in this chapter were related to participant protection linked to human studies was demonstrated through the use of IRB approval from both Capella and the research site.

Chapter 4 will present the results of the data analysis that was obtained by the use of Chapter 3 processes. A detailed description of the samples that agreed to provide data will be given. There will be a presentation of the themes provided by the data collection process as it applies to the data analysis. The chapter will also offer a presentation of the data categories and results. The chapter will end with the summary.

CHAPTER 4. PRESENTATION OF THE DATA

The purpose of this basic qualitative research study was to obtain insight from nursing faculty members as they evaluate student learning during student use of digital technology. The data used in this study were collected from face-to-face faculty interviews and researcher field notes obtained from observation of faculty during class, laboratory, and clinical experiences. Thirteen faculty member participants were interviewed using semi-structured, open-ended questions. The expert reviewed items were specified to guide the interview to the area of student usage of technology and the tools used by faculty for evaluation of student learning during the use of technology-based activities. The results of this study could be used to cultivate evidence-based information related to the tools and techniques used for the evaluation of student learning through the use of technology.

Chapter 4 will provide an introduction section with the description to the role of the researcher to this study, an account of the participant's demographics, procedures used for recruitment and selection of selected participants, and a depiction of each participant. The next section includes the study results and analytical details. The concluding segment will summarize chapter 4.

Introduction: The Study and the Researcher

This basic qualitative study was conducted to explore the tools and techniques used by nursing faculty during the evaluation of student learning through the use of technology-based activities. The purpose of the collected data was to further the literature on assessment and

evaluation in nursing education. While this study is focused on Associate Degree Nursing, the findings apply to all nursing programs that utilize handheld digital technology products for student learning.

The Researcher. The researcher had no prior experience with qualitative research except the dedicated coursework curriculum delivered by Capella University faculty. The course outcomes provided an entry-level understanding to research procedures and practices. A requirement of training modules that were delivered online through the Collaborative Institutional Training Initiative (CITI) was assigned during the early days of the coursework. These modules covered human subject research laws, policies, and procedures. The modules included the rights and protection of the welfare of human research subjects recruited to participate in the research. The modules were set to record satisfactory student completion of competencies that expired at three years and would require the competencies to be updated. Upon being admitted to the dissertation course room, a mentor and committee members were assigned. The assignment of a chair and committee followed the successful completion of all necessary coursework and comprehensive examination. The mentor provided expert guidance in ethical steps needed to ensure the validity and reliability of the content of the research design and subsequent study analysis.

The researcher received Institutional Review Board (IRB) approval from Capella University as well as from the Midwestern college under the researcher study. All required elements were used to follow the IRB recommendations strictly. The integrity of confidentiality was maintained throughout the research and during the data analysis process. The researcher was the sole interviewer, transcriptionist, data reviewer, and the evaluator of the collected data for analysis. Identification of implicit bias was examined, and steps to maintain an impartial

perspective throughout the interview process and during observations were accomplished. Member check of the completed interview transcriptions ensured that no researcher bias was imposed on the transcribed results and established credibility to the subsequent results. The researcher worked alone to conduct, collect, transcribe, code, and analyze all data for this research study.

The researcher is an active nursing faculty member for a community college that utilizes handheld digital technology for student learning. The use of learning activities that incorporate technology is growing in the field of nursing education, and this researcher remains interested in the development of those innovative learning activities. During a career in nursing education, the researcher has been involved in faculty committees that include curriculum development, student activities, and policies, and has presented peer education on the use of technology for the collection of paperless student evaluations. The researcher also developed and presented a department project that examined the usage of a digital technology-based mobile application that provided medication drug books and medical dictionary applications as a tool for nursing students. The findings from this project resulted in a license purchase agreement of the nursing student application for the entire nursing program.

While being a vigorous advocate for technology, there were discussions from fellow instructors related to a question of how to evaluate student's ability to learn through the use of a handheld digital process. This principle question was the bases for the current study. After conducting the literature review, a gap was observed in what tools and techniques are being used as assessment instruments for student learning through technology.

Description of the Sample

A purposive sample was employed for the acquisition of participants that taught in an associate degree nursing program that used digital technology. The study participants were nursing faculty members that were teaching in a community college nursing program that utilizes handheld digital technology for nursing students. The inclusion criteria for the study listed full-time faculty that teach class, laboratory, and clinical areas of nursing school. An introductory email that included the study flyer was sent to the nursing program chairperson with an explanation of the research study, inclusion/exclusion criteria, and the estimated time commitment involved. The chairperson included all of the information in a forwarded email to the 13 full-time faculty members. The 13 participants replied to the introduction, via private email responses. All 13 respondents agreed to participate, and all 13 participants completed the study. The consent form was completed, and each participant signed the document to show agreement with being included in the study.

The participants ranged in age from 25 to 64 years, with a mean average of 44.5 years of age. The years of teaching experience in nursing education for the all-female group stretched from two years to 20 years of experience. The participant group ranking was found to be four instructors, five assistant professors, two associate professors, and two full professors. The level of acquired faculty education demonstrated ten master of science nursing, two doctor of nursing practice, and one doctor of nursing practice candidate. Of the 13 participants, 10 specialize in medical-surgical courses. Table 1 exhibits the demographic data collected for the study participants.

Table 1

Demographics

Participant	Age	Years in Teaching	Highest Degree Held
P1	25-30	2	MSN
P2	36-40	4	MSN
P3	30-35	7	MSN
P4	61-65	13	MSN
P5	30-35	3	MSN
P6	46-50	5	MSN
P7	30-35	3	MSN
P8	56-60	10	MSN
P9	51-55	9	MSN
P10	41-45	8	DNP
P11	61-65	15	MSN-DNP-c
P12	36-40	4	MSN
P13	46-50	20	DNP

The 13 participants teach in class, laboratory, and clinical. The course workload includes an introductory nursing course, assessment courses, foundation course, and medical-surgical course. Each course has a laboratory or clinical component that is a companion course. The faculty are assigned to multiple classes throughout the year and are rotated through clinical assignments. The nursing program is in session year-round and has new nursing student admitted each semester. All participants described English as their language of choice for the interview process.

Research Methodology Applied to the Data Analysis

A basic qualitative methodology was chosen to study the perceptions and observations of nursing faculty members. The participants received a paper copy of the flyer, introduction email, and the consent form at the start of the interview. Any question was addressed and answered to

the participant's satisfaction before the conduction of the meeting. The participants were given a specific coding number such as P1 to P13. The coding number was assigned to them in chronological order of appearance for the protection of confidentiality.

Semi-structured face-to-face interviews were conducted for the collection of data. A digital audio recorder was used with the permission of each participant to collect the interview content accurately. The practice of audio recordings also assisted in the transcription process, allowing this researcher to stop and start the tape as the text words were being documented. Each interview was transcribed to a text document using Microsoft Word® within 24 hours of completion of the interview process.

The interviews were spaced out over three days and were arranged at the convenience of the participants. The entire full-time faculty group employed by the nursing department was used in an attempt to reach data collection saturation. Data saturation did occur through the review of all 13 transcripts and field notes that were analyzed. No new ideas or themes emerged after the seventh interview. All 13 interviews were conducted in a private conference room. Twelve interviews were conducted at the research college site, and one was held in a hospital conference room. The interview time was designated to be 1 hour. However, the majority of interviews concluded at 30 minutes, with the most extended interview taking 40 minutes.

The 13 transcriptions provided the researcher with the data to begin looking for themes through coding of frequently used words and phrases. The interviews revealed the following themes. The first theme was technology usage for teaching and learning. The second theme was faculty perception of student recall using technology. The third theme was faculty perception of the use of technology for teaching and learning, and finally, the techniques for assessment and evaluation of technology usage through the use of handheld digital devices.

The first interview was used to establish the coding themes that would be used to search for key ideas related to the research study question. This first interview analysis was used to compare each subsequent interview against the codes found. Several additional codes became necessary before the saturation was established as well as some early codes were found to be less useful to the study. All collected interviews were read through twice before codes were applied. The process of two read-throughs produced interviews that had been viewed and examined three times in total. A process used for the organization of the findings was Microsoft Excel® spreadsheet.

Presentation of Data and Results of the Analysis

The process of data analysis commenced starting with the first interview, observations, and field notes being collected, and each additional opportunity to collect data provided the researcher with the points of comparison needed for theme development and coding. The interviews were conducted individually and offered different perspectives. However, four overarching themes did emerge. The themes uncovered were technology usage for teaching and learning, faculty perception of the use of technology for teaching and learning, faculty perception of student recall using technology, and techniques for assessment and evaluation of technology usage were the four themes drawn from the data collected. Tables 2 through 5 offer responses received that assisted in the development of the significant themes.

The four semi-structured open-ended questions allowed the participants the chance to reflect on several areas of teaching and learning that technology is being used with students. The four interview questions were used to address the studies research question into the assessment of learning during the use of technology. The following subheading sections will offer faculty descriptions and the results of the data.

Theme 1: Technology for Teaching and Learning. The use of technology for teaching and learning was described by several participants as limited to the classroom use of Nursing Central's Unbound application. There was a conflict with having the textbooks as digital and printed copies. The students have the choice to pick the bundle they want for learning. When the college first went to digital textbooks, students all picked the digital option, but as the years have evolved, the students are shifting back to the printed textbook option. There is one book that is required to be purchased as a printed copy, and that is Ackley's Nursing Diagnosis Handbook. The faculty members do not use technology themselves, but they teach the students some of the functions, and then the student uses the products at their discretion. Course work is not tied to the technology, and many faculty members discussed the examination information comes from the textbook and not from the information in the Nursing Central products. Some faculty members, when answering the question about technology usage, explained the specific products such as tablets, phones, and laptops. Some faculty stated they do not use the technology in the classroom and that it is not allowed by the policy in the clinical setting. These two faculty member comments highlighted two of the familiar lines of discussion from the literature review about terminology for technology and acceptance of technology in nursing practice. Table 2 displays several excerpts from participants' perceptions of the use of technology for teaching and learning.

Table 2

Technology Usage for Teaching and Learning

Participants	Excerpts from Interview Data
P1	<p>In class, we have them use nurse central. And I feel like they look that information up and they put it down on their paper, answer the question, and then that's all they do with it. I don't feel like that information stays with them. In the lab, we don't really use a lot of technology, but we are trying to make the mannequins do a little more. The scenario is a little more realistic and provides a scenario to make, maybe make it more real.</p>
P2	<p>So yeah, I do see all the positives with unbound medicine and nursing central. But I do feel like using the Iggy textbook and having that hard textbook that they have to bring to class every day is very beneficial to make sure that they're pulling information from their textbook. And then using that to apply it to a lot of our class activities. Like I said, we use nursing center for some things or certain things like the web quest activities in which they do search for things on the web or the Internet, but we require them to get the Iggy textbook.</p>
P4	<p>“We're probably using them [technology] the most I would say in clinic, some in class as well, but they have their textbooks for all four courses. That is their primary source of information.”</p>
P6	<p>“The only thing that I use is the nursing central. And if somebody wants to pull it up on their cell phones in clinical or class and then, but I don't do anything to measure their long-term memory.”</p>

Theme 2: Faculty Perception of the Use of Technology. Faculty perception of the use of technology was established by faculty observation of students having increased recall if the

instructor encourages a direct application process for newly obtained data. When the student has searched for data, a faculty member then has the student record the data on paper or has them use the data in a case study situation. The sooner this application process is conducted, the better it was for the student's recall. This activity has not been done consistently.

The faculty do not address the concrete experience of learning from technology. The educators use the idea that the technology products are more of additional teaching aid or search engine for ease of access is the overall feeling expressed by faculty members. A discussed example of the concrete experience of learning was provided by a member that uses the technology by presenting searched information right as the student pulls the info up. This faculty member is attempting to help students use the information in an application type of situation before it is lost from their thoughts. Additionally, by having a student recall a patient they had during clinical to relate the information, helped to place a connection to the searched items. The faculty expressed excitement to see this research study and was hopeful for continued acceptance and usage of technology.

Concern was expressed that with so many avenues to access information, faculty cannot definitively say where a student is learning the information they acquire. Educators stated that they could ask for a recall of information, but they are not sure if the recall is from lectures, notes, textbooks, the Internet, or the students technology. Additionally, faculty members questioned if it is possible there were too many places for students to gain the information and that they have seen some students become overloaded. Table 3 offers excerpts from participants related to the use of technology.

Table 3

*Faculty Perception of the
Use of Technology*

Participants	Excerpts from Interview Data
P1	I just don't feel like it does help them in the classroom. It's nice to have those resources so they can quickly look up things like in class today. I was like well lookup Digoxin toxicity in Nursing Central. So, they did, but if I quiz them about Digoxin toxicity right now. I bet you not half the class retain that information. I like technology, but I don't feel like for learning even for me that it works well. So, I don't think it works well for my students at all. If I read it on a piece of paper, I don't know I remember it better. So, in clinical, I think because they are babies still so I feel like they're in the beginning they're a little slower at bringing forward that recall, but I feel like by the end of the rotation they're much better at being able to do that.
P2	I think by having them actually pull up the information as we're talking about it, then yes, they are able to recall it. It makes for a more engaging post-conference when we can relate it back to you know this patient had a UTI. And then how they couldn't make related to, and as evidenced by, fit for their patient. So yeah, I think retrieving information from previous is always a struggle in first semester until they actually are applying it in real-time.
P5	I personally struggle with the electronic devices and trying to put them together. And in the clinical setting because it just doesn't. They are just not able to take it put it together anymore. I think it's merely just typing it in again, and it spills their information to them so they're not able again to critically think like you would with a textbook. Before they have to read the information and try to figure it out. But instead, we're able to type in CHF, and it gives you everything it gives you in Nursing diagnosis it gives you medications it gives you a patho of physiology they're no longer having to do the research on their own, and I think that's really a hindrance to them.

Table 3 Continued

Participants	Excerpts from Interview Data
P10	"I am sorry, I don't really use it very much so. Pre-conference is kind of where the student would look up meds or things like that; they are not allowed to have devices on the nursing floor."

Theme 3: Student Recall Using Technology. An overall feeling expressed by faculty was that there was a lack of ability to recall information from students. The faculty felt the act of remembering prior content was difficult for students in the early courses and the capacity tended to develop into a stronger ability as they progress through later classes. The faculty member's stated that when students were looking-up the information and required to create a medication card with the data, that they had a better chance of recalling what they learned. Additional faculty member comments explained that with repetition of the teaching, was where the student began to remember and recall the taught content. The example provided was related to the communication tool used in nursing known as SBARR (Sabio & Petges, 2019). An SBARR tool stands for Situation, Background, Assessment, Recommendations, and Review/Response. SBARR is used during situations when giving and receiving patient information to and from others in the care team. The SBARR learning activity is started early in the nursing program, and is used consistently throughout each course and in all areas of the nursing program, from class, laboratory, and clinical. Table 4 provides additional support to the perception of learned recall.

Table 4

*Student Recall Using
Technology*

Participants	Excerpts from Interview Data
P5	I don't think they're able to recall it. I think it's a matter of going back and having to relook everything up because they're not physically having to do the research because somebody else is doing it for them. The electronic device doing it for them. So, I think they really struggle with that. It's easy enough to just take what the computer screen says and write it down and change their verbiage than it is to read it in the book and try to assess what it's saying. Being able to see them grow from introduction to nursing and nursing assessment and into that first Foundation's class and see how they're starting to put the pieces together of nursing care plan I feel is very weak. So, they're not really able to critically think and bring it forward.
P7	Yeah. I do not think that they know, I do not think that it sticks probably with them. Initially, I think that I think it is something that they look up. They have to utilize and look up on it (technology) on a normal basis. I think that eventually, it would stay with them, but I don't think it's something that I think of it like you'd asked them to look up something earlier, and then you're like, oh no, what did they say. They most likely would probably have to look it up again.
P8	So I feel like they struggle with that unless they've made a connection to you know whatever they were learning and they put it into scenarios, or they were maybe working as an aide, and they saw some of that then they might have a little bit better recall for that, but I would say even in sim today the students had done a care plan and they just turned it in. I think it was due Monday, so yesterday, and I said OK, so what was your care plan on what was your nursing diagnosis? What were your interventions? And half of them were like I don't remember.
P13	"I don't believe they're able to recall it, later on, I believe they have to look it up again."

Theme 4: Assessment and Evaluation of Technology Learning. When asked if they use any pop quizzes or other means to assess student learning with the use of technology, the overall response was a negative answer. The faculty members use different types of assessment and evaluation tools for general learning activities but not for the specific use of technology. Still, the majority of the content is delivered in such a varied platform that there is no way to explicitly say the students answered a question correctly because of seeing it on their handheld digital device or technology. Participants discussed using case studies to assess student understanding, and others used informal questions to determine what the student retained from prior classes or pre-class assignments. Faculty members mentioned that concepts for examination are taken from the textbooks and PowerPoint instead of anything that is found in their Nursing Central products. A small percent of the faculty use Kolb's to assist in helping the student to retain learned material. However, there is no formal testing or quizzing being done to indicate if the information was retained. Table 5 offers samples of what each of the participants stated about using pop quizzes and tests to assess learning from technology.

Table 5

*Assessment and
Evaluation of
Technology Usage*

Participants	Excerpts from Interview Data
P5	"I don't. I guess for a simulation, this would be the biggest one for me seeing it."

Table 5 Continued

Participants	Excerpts from Interview Data
P3	We do the round-robin which you kind of got to watch that they don't know who I'm clking on next. They don't have time to pull up whatever it is or leave through their notes. So, when we do when I call it a check-in because I don't like them to feel that pressure of a pop quiz. I like them; we just feel more like that. We're just kind of getting a feel for where they're at. But we, we do go over not just the right answer for that, but we go over every one of those and how they could relate to whatever else we're talking to in class. So, I feel like that is a really good way of kind of tapping into that long-term memory there.
P7	I'm not sure that this was happening that we've done this specifically on something that they've retrieved electronically. I know there's a lot of pop quizzes. I know we've done some Socratic questioning, but I think a lot of it comes from their reading versus what is being covered or what the lecture was prior to the week prior to not necessarily what they learned. Looking up something electronically does that make sense.
P9	"We have a quiz tomorrow. We'll see whether that the notes that they took from the activity today, they've retained the information we talked about in the classroom."

Summary

Chapter 4 provided a deep understanding of the presentation of the collected research data. The study and the researcher were introduced, and a detailed description of the privacy steps used to protect the sample was offered. This chapter also illustrated how the research methodology was being applied to the data analysis process. The data analysis process described was applied to the four semi-structured questions to provide the researcher with individual categories to compare for themes of commonality.

The interview questions were used to understand participants' reflections from class, laboratory, and clinical of watching students using long-term memory from concepts taught prior. The answers received displayed concern over a lack of consistency for recall of learned concepts and material. Some growth of memory recall is noted from early nursing courses to the final classes. When interviewed, participants were tasked with describing students using technology. Responses indicated faculty members perceived a lack of purposeful usage. Participants reported the student using technology to search for information were having to look the same data facts up. And when questioned about the use of assessment tools such as quizzes or Socratic questions, no formal evaluation is being done for assessment of technology.

Chapter 5 will provide a summary, discussion, and conclusion based on the results. A comparison of findings to the theoretical framework will be presented. Previous literature, as well as this researcher's interpretation of the findings, will be paralleled. The researcher will deliver study limitations, implications for practice, as well as possible recommendations for future research studies to further the discussion of evaluation tools for technology in nursing education.

CHAPTER 5. DISCUSSION, IMPLICATIONS, RECOMMENDATIONS

The objective of this basic qualitative study was to research the assessment tools used by nursing faculty to evaluate student learning with the use of handheld digital devices. Faculty use of Kolb's experiential learning theory (Kolb, 1984) to assess completion of the steps for learning was the secondary purpose of the research. Chapter 5 presents a discussion of the research results, and the conclusions reached based on the results. A comparison of the research findings to the results found from the literature review of previous work will be examined. The conclusion of the study will provide known limitations, practice implications, and recommendations for future research into nursing faculty assessment tools used to evaluate technology use for student learning.

Summary of the Results

Thirteen faculty members from a midwestern community college provided perspectives of student recall of learned material that was obtained through the use of technology. Interview questions were used to stimulate open dialogue about the use of Kolb's learning theory and the student's use of technology for learning. The interviewed faculty provided observations of students struggling with recall of content learned from the prerequisite courses as well as noted difficulty of students in recalling information learned from nursing course to nursing course. The faculty could not identify the technology as specifically responsible for student learning. Twelve of the interviewed members reported a lack of technology use in a meaningful way for learning in the nursing courses.

The faculty members were interviewed and none reported implementation of formal evaluation of learning with the use of technology. There were no specific learning activities or rubrics used to measure student learning from any of the observed student usage of technology. The research participants expressed difficulty in pointing to one particular teaching and learning modality that could account for the student's acquisition of new knowledge. Additionally, there were no universal plans for the usage of technology from instructor to instructor. Each educator used academic independence to incorporate technology into their course.

While there was interest in development of tests and validation tools, the faculty felt that with the concern over student distraction and the cited security risks that technology was viewed more as a teaching aid, and not a true learning modality. The use of electronic textbooks also failed to produce confidence from faculty with evidence shown that faculty require the purchase of one printed copy textbook in addition to the electronic versions, and the revelation that faculty were observing the student trends wavering back to printed copies of all textbooks.

Discussion of the Results

The focus of the research question was the tools and techniques faculty members use to evaluate student learning capability with the use of handheld digital devices. Kolb's experiential learning theory (Kolb, 1984) provided the framework for the appraisal of whether the students are following the steps that produce recallable learning when they are using technology. The interview question was used to prompt faculty member's perceptions related to the student memory recall, use of handheld digital devices, short-term recall of searched data. The final interview question was: What tools were being utilized for assessment of learning when students have been using handheld digital devices.

The recalled material did not have to be something they had explicitly learned from technology. Participants addressed students trying to bring forward information they learned in a prior anatomy and physiology course. Reported information indicated the student tends to memorize information for exams, and instead of retaining the material, they dump the content for the following exam data. The consequence of the dumping process is seen in class as the student struggles to recall the previous material. Half of the participants felt that the clinical is where the recall of long-term memory would be most relevant for patient care and safety. The student is tasked with bringing the theory content to bed-side patient care. Faculty felt the students in the first semester continued to have a difficult time applying the material they learn in a recall situation. Information discussed related to students an introductory course and also a foundation course found they do not bring the learned material they just learned from course to course. Faculty described that they noticed the student was still trying to memorize just what they need to know for the moment. Of the 13 participants, five observed students having a hard time with the long-term recall of prior material. Three participants did not see any difficulties with memory recall and felt the students did a good job of bringing content forward from previous learning experiences. Whereas, three participants did not provide a response to the question.

The observations of students using flashcards, written notes, or marking the tablet with a favorite notation to help develop a connection to searched content was helpful for students recall. Ten of the participants witness students speaking the material, applying the data to a current patient, or adding to a discussion in pre and post conferences. Some students were observed using the data during the writing of a clinical care plan form. When thinking of students using recall, more than half of the faculty participants stated the students do not have good recall. The

group also answered that with the use of some practical application of the data, there was an improved ability for the student to recall the data.

Nine participants stated there would be no way to know for sure that any questions answered on their current quizzes and tests were learned from handheld technology only. The faculty explained that students received new content from in-class lectures, pre-class assignments, require reading from textbooks, as well as in-class activities. Eleven of the participants indicated that they do not integrate much technology into the course work. Twelve instructors that taught a class and clinical experiences stated they only have students use the devices and products for search engine activities. The use of the student nurse application Nursing Central by Unbound was one application that was mentioned by the participants. Nursing Central offers online access to Davis Drug Guide, nursing formula calculators and provides instant searchable access to needed data. The Unbound product was used by students as a tool for searches during class, laboratory, and clinical in the designated technology areas. The laboratory instructors stated that they do not allow technology usage except for limited access during pre-conference. The nursing program offers both digital and printed versions of textbooks as student choices. However, there is a patient care planning book that must be purchased as a printed version.

Participant discussions related to student recall of previously learned material brought forth results that faculty have no specific way to know precisely where the student is learning the information. The concept is delivered by multiple avenues such as lecture, PowerPoint (some with voice-over) pre-class textbook reading activities, in-class activities, prior course requirements, laboratory activities, and finally, clinical activities. This wide variety of learning methods makes it virtually impossible for the faculty to say precisely what source the student is

drawing a recalled memory from when asked for a repeat demonstration. When asked to discuss how the student used the searched data, some faculty felt that when the student applied the data, it helped the student retain the learned information. The act of applying the knowledge to their notes, flashcards, a current or previous patient, or a case study seemed to assist the student in recalling that information for a future need. Even if the search content was used in a conference discussion, the student had an increased chance of remembering it the next time it was needed.

The reluctance to include technology in the course work for nursing has many reasons. The list of hindrances includes; lack of faculty training and comfort level, to inconsistent usage, and lack of time to create activities. The chief stated concern was related to student cheating through the use of a technology device. The usage of handheld digital devices holds tremendous power of possibilities for learning and engagement, as well as the ability to produce harmful activities that could lead to cheating and security breakdowns. As faculty members, there must be a way to manage both positive and negative possibilities and to utilize the device for impactful learning.

Conclusions Based on the Results

The purpose of the study was to obtain perceptions from the nursing faculty of student learning from the use of handheld digital device technology. The integration of technology has become widespread in nursing education (Chang et al., 2018). From the learning management systems that electronically hold all course content to the electronic textbooks, students and faculty are faced with technology. Students entering nursing courses have been exposed to technology in primary education, at home, and on the job. Nursing faculty are being asked to develop activities and to include technology as a way to increase student engagement (Tang & Barnett-Ellis, 2017).

The reviewed articles from the Chapter 2 literature review, discuss the positive influence technology has played in education without offering research into how to evaluate the process of learning as the student uses technology. Holmes and Lindsay (2018) presented the question of how technology is being assessed for deep learning. The literature review displayed a gap in research that examined the tools and techniques being used to assess and evaluate learning through the use of technology-driven activities.

The integration of technology has widely been accepted in nursing programs at varying degrees. Previous researchers have examined the integration from several angles. Much of the research focused on student satisfaction and faculty perception of the inclusion of technology. The study attempted to validate the use of technology for learning. Through the use of the semi-structured interview questions, four distinct conclusions could be drawn.

1. The first-year nursing students have greater difficulty bringing content forward from previous non-nursing courses as well as from nursing class to the next nursing class. The second-year student develops an improved ability as they progress to completion.
2. Faculty members do not see students using the data in a meaningful way after they search using handheld digital devices. Only after the faculty members direct them to take notes, or to write a flashcard, or to use the data in some other way has there been an increased ability to recall the data at a later time.
3. The faculty members do not follow up with a student after a search was completed to assess if they recall the data or if an additional search is required to refresh the memory. No follow-up assessment is currently being conducted.
4. No formal assessment or evaluation is being conducted to measure student learning from the handheld digital device and technology. No value has been placed on the

usage of technology for learning. The greatest usefulness is found in the ease of search capabilities.

The integration of technology into nursing education has increased each year with the addition of handheld digital devices, electronic textbooks, and nursing applications for drug guides (Lai & Wu, 2016). The gap noticed from the reviewed literature was found in a lack of tools to assess and evaluate learning when a student is using technology.

Comparison of Findings With Theoretical Framework and Previous Literature

The theoretical framework used for this study was Kolb's experiential learning theory (Kolb, 1984). Experiential learning theory (ELT) uses a cycle of learning steps that follows a student as they proceed from learning a new concept, reflecting on that concept, transformation of the concept into an abstract generalization, and finally, how the student pulls the previously learned information out to apply in a new similar learning experience. Kolb felt that without following these steps, the student would not retain information from the learning experience. From the research questions, the faculty members provided a clear connection of the need for repeated searches. If the faculty did not guide the student to reflect on the information learned through some additional type of activity, then the data was lost, or at the minimum, it was not retained, and a repeat learning experience was required (Fairhurst et al., 2017).

The nursing profession is a career that requires the professional to learn information, reflect on the information, conceptualize, and then to use that same data when they have a changing patient condition (Bartsch et al., 2018). It is through those steps, the ability to recognize changing patient cues and then to act on those cues with the use of previously

experienced situations, and based on prior learned information, that a nurse utilizes clinical reasoning. The delay of critical thinking, as described, prevents a dire condition known as failure to rescue (Garvey, 2015; Herron, 2018). Nursing school is the formal training ground for the development of this vital thought process. As nursing schools continue to rely heavily on technology, a means to assess the student as they learn will assure faculty members that critical thinking is being established.

The results of the research study support the findings that faculty members have not evaluated student's usage of technology for learning and have not utilized assessment tools or techniques related to student's recall of the material being used with technology in class, laboratory, or clinical. The need to support students through the steps of ELT is essential to the development of a reflective and conceptualization practice that can be used by graduated nurses when facing changing patient cues (Garvey, 2015; Herron, 2018).

Interpretation of the Findings

This study differed from other research by placing primary focus on the effectiveness of technology for learning and on the use of Kolb's theory (2015) for assessment of that learning. The guided interview questions pointed faculty to look at ELT as it related to how learning activities that incorporate technology are following the learning steps to instill knowledge. The literature reviewed demonstrated a focus on the perceptions of how well technology is liked by faculty and students (Day-Black & Merrill, 2015) as well as how it is accepted in education.

When presented with the semi-structured questions for the research, the faculty participants needed time to understand the new direction of the questions. The majority of reactions during the interview process indicated faculty had not thought about the evaluation element of learning. There was a sense of surprise that appraisal of technology for learning was

the focus. A few faculty members did not provide answers to the questions being asked, and instead began to talk about their likes and dislikes with the use of technology. Almost all faculty discussed the clinical site limitations and pointed to those policies as a reason they do not use technology even for class. The commenter explained that they did not want students to become dependent on a tool they would not have available in the clinical area.

The research results offer information that shows technology usage is not being incorporated into courses with any purposeful plan. Each faculty member has a different impression of the positive aspects of technology and handheld digital devices use for nursing education. The detailed information provided by the participants showed the thoughtful recollections of educators that want to do the best possible job for their students. The same participants are not clear on the actual value of including technology as a learning method. It appears from the interviews that technology is being viewed as a supplemental aid for instruction. A tool that students can use for quick searches. No current assessment is being done to evaluate the efficacy of technology being used in nursing classes. There is a broad spread integration of technology without a means to assess the significance of its use.

Limitations

Several limitations are evident in the research study. The lack of literature pertaining to evaluation tools being used to assess student learning is considered to be a significant limitation. While the lack of prior studies provided a valid gap for research, this lack created a challenge for narrowing the focus of this study. While the broad topic of technology is widely examined in the research, the direct examination of learning while using this modality is underrepresented in the publications. The researcher found that even during this research study, it was difficult to focus the participants on the area of evaluation of technology for learning. The commonly witnessed

discussions revolved around the faculty member's personal feelings about the use of technology and the difficulty with acceptance of technology in patient care areas. An additional focus from the interviews and noted from field observation was the concern of student cheating through the use of technology, by way of texting information to other students, or by recording activities. While this was not a focus of the principle study, this subject was what the faculty members offered as explanations as to why they avoid course involvement with technology.

A second limitation noted was the small sample size, which was located in a single study site creating a barrier to the generality for the results. An increase of allotted research time and a more extensive study budget could have provided the ability to expand the research to several community colleges for a broader pool of sample responses. However, this small-scale research study offers the future researcher with the foundation for a more robust examination of faculty tools for assessment of student learning through the use of technology.

Implications for Practice

The research study uncovered the lack of reliable tools to measure student learning with the addition of technology to nursing education. This finding is important not only to nursing education but to all disciplines in higher education that are integrating technology applications for learning. Educators strive to make proper use of the classroom learning time. Without a clear understanding of the strength or weaknesses of using technology for learning, we are failing to identify the real purpose of technology use for the student.

If more faculty members could evaluate the educational benefit provided from the use of technology for student learning, there might be increased acceptance. The proven perceived element of increased engagement is of value and should not be discounted. However, the need to determine instructive value must be paramount when courses of study are considering this

addition to the program hours (Castro et al., 2019; Holmes & Lindsay, 2018). Articles such as the one presented by Victor, Havrilla, and Zbegner (2019) offered evidence of the benefit to learning, but place a stipulation that there is no way to directly attribute the increased knowledge to the gaming activity since there were additional educational factors changed simultaneously.

The theoretical implications of this study found that faculty members are not utilizing a learning theory foundation on the inclusion of technology to the activities. The addition of technology is relegated to a form of a search engine product. The term used to describe the traditional teaching style of word problem-based instruction by Castro et al. (2019) was *chalk and talk assessment of pedagogy*. This teacher-centered learning theory does not fit the real-time student action with simulation gamification and is also true for many of the newer activities that have technology integrated. Each addition of technology-based products and activities need to have an andragogy theory tied to the activity to support evaluation and assessment.

Recommendations for Further Research

Several suggestions for future research became evident during this research study. The first recommendation would be to increase the sample size and expand to greater inclusion of colleges and universities. Technology is being included in many colleges and universities, and an evaluation of the tools used would benefit nursing programs on a large scale.

A second study should not only be limited to associate degree nursing programs but should be inclusive of all higher education nursing programs as well. A determination would need to be made to include public and private places of education. Additional considerations should be made to the location of future studies. The inclusion of all Schools of Nursing that include technology worldwide would provide substantial results for the field.

The primary concentration of this research study was focused on the perceptions of nursing faculty members. An additional qualitative study dedicated to the student perception of the strength of learning with the use of technology and how impactful they feel they are retaining information through the use of technology would benefit educators. A quantitative query of technology usage and the number of time students access specific technology for searches, and if the search must be repeated due to failure to retain the information would significantly add to the field of study.

Conclusion

This basic qualitative research study was used to explore the use of handheld digital devices and the subsequent tools used to measure knowledge in students who learn through the use of technology. Thirteen educators were interviewed using semi-structured questions to obtain observations and perceptions of nursing students using handheld digital devices during nursing courses. Findings from the study indicated that faculty members could not identify where the student was obtaining newly acquired learning. With the use of multiple delivery methods that include technology, faculty cannot definitively say where the knowledge had been communicated to the student. The course exams and tests that were given to assess student knowledge were based on the textbook information only.

Identified findings from the study delivered essential implications for nurse educators teaching students that utilize handheld digital devices. For improved student memory recall of content delivered through the use of technology, additional application activities need to be included. The participants' examples demonstrated the need to have the student use flashcards or case studies as an application activity. An additional consideration discovered is the lack of

technology usage protocol throughout the nursing program. Faculty usage inconsistency was found to be present in the sample.

The interviewed faculty agreed no established protocol would assess student learning with the use of technology. Several participants expressed interest in developing tools that could validate student learning with the use of technology. The study results indicate the student can have an increased ability to recall information that is garnered from technology if the faculty member supported them to use the data in activities that create reflection. Memory recall improved if the student was prompted to apply the data to an actual event, such as the act of note-taking or a case study of a patient situation. A policy of technology assessment that would provide educators with tools that can be used to appraise student learning's efficacy would be of benefit as educators continue to integrate technology into the nursing curriculum.

REFERENCES

- Alsayed, S., Bano, N., & Alnajjar, H. (2019). Evaluating practice of smartphone use among university students in undergraduate nursing education. *Health Professions Education, 6*(2), 238-246. doi:10.1016/j.hpe.2019.06.004
- Alt-Gehrman, P. (2019). Nursing simulation and transfer of knowledge in undergraduate nursing programs: A literature review. *Nursing Education Perspectives, 40*(2), 95-98. doi:10.1097/01.NEP.0000000000000398
- Baron, K. A. (2017). Changing to concept-based curricula: The process for nurse educators. *The Open Nursing Journal, 11*, 277-287. doi:10.2174/1874434601711010277
- Bartsch, L. M., Singmann, H., & Oberauer, K. (2018). The effects of refreshing and elaboration on working memory performance, and their contributions to long-term memory formation. *Memory & Cognition, 46*, 796-808. doi:10.3758/s13421-018-0805-9
- Bautista, J. R. (2019). Filipino nurses' use of smartphones in clinical settings. *CIN: Computers, Informatics, Nursing, 37*(2), 80-89. doi:10.1097/CIN.0000000000000482
- Beers, G. W., & Berry, C. G. (2015). Traditional versus electronic resources for students in clinical nursing courses. *On-Line Journal of Nursing Informatics, 19*(1), 1-8. Retrieved from <https://search.proquest.com/openview/3a6da179fed2df47416ca006a476ea3/1?pq-origsite=gscholar&cbl=2034896>
- Billings, D. M., & Halstead, J. A. (2016). *Teaching in nursing: A guide for faculty* (5th ed.). St. Louis, MO: Elsevier.
- Billingsley, L., & McKee, S. A. (2016). Cybersecurity in the clinical setting: Nurses' role in the expanding "Internet of Things." *The Journal of Continuing Education in Nursing, 47*(8), 347-349. doi:10.3928/00220124-20160715-03
- Boostel, R., Felix, J. V. C., Bortolato-Major, C., Pedrolo, E., Vayego, S. A., Mantovani, M. F. (2018) Stress of nursing students in clinical simulation: A randomized clinical trial. *Revista Brasileira de Enfermagem, 71*(3), 967-74. doi.10.1590/0034-7167-2017-0187
- Bove, L. A. (2020). Integration of informatics content in baccalaureate and graduate nursing education: An updated status report. *Nurse Educator, 45*(4), 206-209. doi:10.1097/NNE.0000000000000734
- Buchin, Z. L., & Mulligan, N. W. (2019). The testing effect under divided attention: Educational application. *Journal of Experimental Psychology: Applied, 25*(4), 558-575. doi:10.1037/xap0000230

- Bullin, C. (2018). To what extent has doctoral (PhD) education supported academic nurse educators in their teaching roles: An integrative review. *BMC Nursing*, *17*(6), 1-18. doi:10.1186/s12912-018-0273-3
- Cabral, A., & Baptista, A. (2019). Faculty as active learners about their practice: Toward innovation and change in nursing education. *Journal of Continuing Education in Nursing*, *50*(3), 134-140. doi:10.3928/00220124-20190218-09
- Castro, M. J., Lopez, M., Cao, M. J., Fernandez-Castro, M., Garcia, S., Frutos, M., & Jimenez, J. M. (2019). Impact of educational games on academic outcomes of students in the degree in nursing [Supplemental material]. *PLOS ONE*, *14*(7), 1-12. doi:10.1371/journal.pone.0220388
- Cernusca, D., Thompson, S., & Riggins, J. (2018). Learning sterile procedures through transformative reflection: Use of iPad videos in a nursing laboratory course. *Nurse Educator*, *43*(6), 330-333. doi:10.1097/NNE.0000000000000491
- Chang, C. Y., Lai, C. L., & Hwang, G. J. (2018). Trends and research issues of mobile learning studies in nursing education: A review of academic publications from 1971 to 2016. *Computers & Education*, *116*, 28-48. doi:10.1016/j.compedu.2017.09.001
- Cheng, M., & Yuen, A. H. K. (2018). Student continuance of learning management system use: A longitudinal exploration. *Computers & Education*, *120*, 241-253. doi:10.1016/j.compedu.2018.02.004
- Chicca, J., & Shellenbarger, T. (2018). Connecting with Generation Z: Approaches in nursing education. *Teaching and Learning in Nursing*, *13*, 180-184. doi:10.1016/j.teln.2018.03.008
- Chu, T., Wang, J., Monrouxe, L., Sung, Y., Kuo, C., Ho, L., & Lin, Y. (2019). The effects of the flipped classroom in teaching evidence based nursing: A quasi-experimental study. *PLOS ONE*, *14*(1), e0210606. doi:10.1371/journal.pone.0210606
- Chuang, Y., Lai, F., Chang, C., & Wan, H. (2018). Effects of a skill demonstration video delivered by smartphone on facilitating nursing students' skill competencies and self-confidence: A randomized controlled trial study. *Nurse Education Today*, *66*, 63-68. doi:10.1016/j.nedt.2018.03.027
- Clark, A., Glazer, G., Edwards, C., & Pryse, Y. (2017). Transforming nursing education with Apple technology. *Nurse Educator*, *42*(2), 91-94. doi:10.1097/NNE.0000000000000314
- Cho, S., & Lee, E. (2016). Distraction by smartphone use during clinical practice and opinions about smartphone restriction policies: A cross-sectional descriptive study of nursing students. *Nurse Education Today*, *40*, 128-133. doi:10.1016/j.nedt.2016.02.021

- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design choosing among five approaches* (4th ed.). Thousand Oaks, CA: Sage Publications Ltd.
- Cummins, M. R., Sward, K. & Guo, J. (2015). Leaders in nursing informatics education and research. *CIN: Computers, Informatics, Nursing*, 33(9), 379–381. doi:10.1097/01.NCN.0000471466.92959.90.
- Curl, E. D., Smith, S., Chisholm, Le Ann., McGee, L. A., & Das, K. (2016). Effectiveness of integrated simulation and clinical experiences compared to traditional clinical experiences for nursing students. *Nursing Education Perspectives*, 37(2), 72. doi:10.5480/15-1647
- Day-Black, C. (Fall 2015). Minorities in nursing education: Using smartphones. *The Association of Black Nursing Faculty Journal*, 26(4), 85-89. Retrieved from <https://www.abnf.net/publications/>
- Day-Black, C., & Merrill, E. B. (2015). Using mobile devices in nursing education. *Association of Black Nursing Faculty, Inc.*, 26(4), 78-84. Retrieved from <https://www.abnf.net/publications/>
- den Hartigh, E., Ortt, J. R., van de Kaa, G., & Stolwijk, C. C. M. (2016). Platform control during battles for market dominance: The case of Apple versus IBM in the early personal computer industry. *Technovation*, 48-49, 4-12. doi:10.1016/j.technovation.2015.12.001
- Echenique Gallardo, E. (2014). An integrative review of literature on learners in the digital era [Abstract]. *Studia paedagogica*, 19(4), 161-184. doi:10.5817/SP2014-4-8
- Fairhurst, M. T., Scott, M., & Deroy, O. (2017). Voice over: Audio-visual congruency and content recall in the gallery setting. *PLOS ONE*, 12(6), 1-14. doi:10.1371/journal.pone.0177622
- Fitzgerald, A., McNelis, A. M., & Billings, D. M. (2020). NLN core competencies for nurse educators: Are they present in the course descriptions of academic nurse educator programs? *Nursing Education Perspectives*, 41(1), 4-9. doi:10.1097/01.NEP.0000000000000530
- Forehand, J. W., Miller, B., & Carter, H. (2017). Integrating mobile devices into the nursing classroom. *Teaching and Learning in Nursing*, 12, 50-52. doi:10.1016/j.teln.2016.09
- Foronda, C. L., Alfes, C. M., Dev, P., Kleinheksel, A. J., Nelson, D. A., O'Donnell, J. M., & Samosky, J. T. (2017). Virtually nursing. Emerging technologies in nursing education. *Nurse Educator*, 42(1), 14-17. doi:10.1097/NNE.0000000000000295

- Gallegos, C., & Nakashima, H. (2018). Mobile devices: A distraction, or a useful tool to engage nursing students? *Journal of Nursing Education*, 57(3), 170-173. doi:10.3928/01484834-20180221-0
- Galvan, J. L., Galvan, M., & ProQuest Ebooks. (2017). *Writing literature reviews: A guide for students of the social and behavioral sciences* (7th ed.). New York, NY: Routledge, Taylor & Francis Group. doi:10.4324/9781315229386
- Garvey, P. K. (2015). Failure to rescue: The nurse's impact. *Medsurg Nursing*, 24(3), 145-149. Retrieved from <http://www.medsurnursing.net/cgi-bin/WebObjects/MSNJournal.woa>
- Gavino, A. I., Ho, B. L. C., Wee, P. A. A., Marcelo, A. B., & Fontelo, P. (2013). Information-seeking trends of medical professionals and students from middle-income countries: A focus on the Philippines. *Health Information & Libraries Journal*, 30(4), 303-317. doi:10.1111/hir.12032
- George, T. P., & DeCristofaro, C. (2016). Use of smartphones with undergraduate nursing students. *Journal of Nursing Education*, 55(7), 411-415. doi:10.3928/01484834-20160615-11
- Goodchild, T. (2018). Does technology really enhance nurse education? *Nursing Education Today*, 66, 69-72. doi:10.1016/j.nedt.2018.04.005
- Gueval, J., Tarnow, K., & Kumm, S. (2015). Implementing e-books: Faculty and student experiences. *Teaching and Learning in Nursing*, 10(4), 181-185. doi:10.1016/j.tein.2015.06.003
- Guo, P., Watts, K., & Wharrad, H. (2016). An integrative review of the impact of mobile technologies used by healthcare professionals to support education and practice. *Nursing Open*, 3(2), 66-78. doi:10.1002/nop2.37
- Halamka, J. D., & Tripathi, M. (2017). The HITECH era in retrospect. *The New England Journal of Medicine*, 377(10), 907-909. doi:10.1056/NEJMp1709851
- Haraldseid, C., Friberg, F., & Aase, K. (2015). Nursing students' perceptions of factors influencing their learning environment in a clinical skills laboratory: A qualitative study. *Nurse Education Today*, 35, e1-e6. doi:10.1016/j.nedt.2015.03.015
- Haraldseid, C., Friberg, F., & Aase, K. (2016). How can students contribute? A qualitative study of active student involvement in development of technological learning material for clinical skills training. *BMC Nursing*, 15(2), 1-10. doi:10.1186/s12912-016-0125-y
- Herron, E. K. (2018). New graduate nurses' preparation for recognition and prevention of failure to rescue: A qualitative study. *Journal of Clinical Nursing*, 27(1-2), e390-e401. doi:10.1111/jocn.14016

- Hill, B. (2017). Research into experiential learning in nurse education. *British Journal of Nursing*, 26(16), 932-938. doi:10.12968/bjon.2017.26.16.932
- Holmes, C., & Lindsay, D. (2018). “Do you want fries with that?”: The McDonaldization of university education—Some critical reflections on nursing higher education. *SAGE Open*, 8(3), 215824401878722. doi:10.1177/2158244018787229
- Hussey, P. A., & Kennedy, M. A. (2016). Instantiating informatics in nursing practice for integrated patient centred holistic models of care: A discussion paper. *Journal of Advanced Nursing*, 72(5), 1030-1041. doi:10.1111/jan.12927
- Judge, D. S., & Murray, B. (2017). Student and faculty transition to a new online learning management system. *Teaching and Learning in Nursing*, 12(4), 277-280. doi:10.1016/j.teln.2017.06.010
- Kahlke, R. M. (2014). Generic qualitative approaches: Pitfalls and benefits of methodological mixology. *International Journal of Qualitative Methods*, 13(1), 37-52. Retrieved from <https://journals.sagepub.com/home/ijq>
- Kallio, H., Pietila, A., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: Developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, 72(12), 2954-2965. doi:10.1111/jan.13031
- Kardong-Edgren, S., Oermann, M. H., & Rizzolo, M. A. (2019). Emerging theories influencing the teaching of clinical nursing skills. *The Journal of Continuing Education in Nursing*, 50(6), 257-262. doi:10.3928/00220124-20190516-05
- Knowles, M. S., Holton, E. F., & Swanson, R. A. (2015). *The adult learner* (8th ed.). New York, NY: Routledge.
- Kolb, A. Y., & Kolb, D. A. (2005) Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning & Education*, 4(2), 193–212. doi:10.5465/AMLE.2005.17268566
- Kolb, D. A. (1984) *Experiential learning: Experience as the source of learning and development*. Upper Saddle River, NJ: Prentice Hall.
- Kolb, D. A. (2015). *Experiential learning: Experience as the source of learning and development* (2nd ed.). Upper Saddle River, NJ: Pearson Education, Inc.
- Kotcherlakota, S., Kupzyk, K. A., & Rejda, P. (2017). Years of experience as a predictor of nurse faculty technology use. *Journal of Nursing Education*, 56(2), 115-119. doi:10.3928/01484834-20170123-09

- Kubec, C. (2017). Reducing nursing student attrition: The search for effective strategies. *The Community College Enterprise*, 23(1), 60-68. Retrieved from <https://www.schoolcraft.edu/cce>
- Lai, C., & Wu, C. (November 2016). Promoting nursing students' clinical learning through a mobile e-portfolio. *CIN: Computers, Informatics, Nursing*, 34(11), 535-543. doi:10.1097/CIN.0000000000000263
- Langley, A., & Klag, M. (2019). Being where? Navigating the involvement paradox in qualitative research accounts. *Organizational Research Methods*, 22(2), 515-538. doi:10.1177/1094428117741967
- Lee, H., Min, H., Oh, S., & Shim, K. (2018). Mobile technology in undergraduate nursing education: A systematic review. *Healthcare Informatics Research*, 24(2), 97-108. doi:10.4258/hir.2018.24.2.97
- Loaiza, V. M., & Halse, S. C. (2019). Where working memory meets long-term memory: The interplay of list length and distractors on memory performance. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 45(8), 1455-1472. doi:10.1037/xlm0000652
- Mackay, B. J., Anderson, J., & Harding, T. (2017). Mobile technology in clinical teaching. *Nurse Education in Practice*, 22, 1-6. doi:10.1016/j.nepr.2016.11.001
- Madhav, K. C., Sherchand, S. P., & Sherchan, S. (2017). Association between screen time and depression among US adults. *Preventive Medicine Reports*, 8, 67-71. doi:10.1016/j.pmedr.2017.08.005
- Malterud, K., Siersma, V. D., & Guassora, A. D. (2016). Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research*, 26(13), 1753-1760. doi:10.1177/1049732315617444
- McCarthy, M. (2016). Experiential learning theory: From theory to practice. *Journal of Business & Economics Research*, 14(3), 91-100. doi:10.19030/jber.v14i3.9749
- McNally, G., Frey, R., & Crossan, M. (2017). Nurse manager and student nurse perceptions of the use of personal smartphones or tablets and the adjunct applications, as an educational tool in clinical settings. *Nurse Education in Practice*, 23, 1-7. doi:10.1016/j.nepr.2016.12.004
- Mennenga, H. A. (2016). Nursing student perceptions of digital textbooks: A pilot study. *Nursing Education Perspectives*, 37(2), 107. doi:10.5480/14-1377
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research A guide to design and implementation* (4th ed.). San Francisco, CA: John Wiley & Sons, Inc.

- Merrill, E. B. (2015). Integrating technology into nursing education. *The ABNF Journal: Official Journal of the Association of Black Nursing Faculty in Higher Education, Inc*, 26(4), 72-73. Retrieved from <https://www.abnf.net/publications/>
- Miller, G. A., Galanter, E., & Pribrum, K. (1960). *Plans and the structure of behavior*. New York, NY: Henry Holt and Co.
- Montagni, I., Guichard, E., Carpenet, C., Tzourio, C., & Kurth, T. (2016). Screen time exposure and reporting of headaches in young adults: A cross-sectional study. *Cephalalgia*, 36(11), 1020-1027. doi:10.1177/0333102415620286
- National Council of State Boards of Nursing. (2019). *2019 Licensure Requirements*. Chicago, IL: NCSBN. Retrieved from <https://www.ncsbn.org/licensure.htm>
- Neuman, D. (2014). Qualitative research in educational communications and technology: A brief introduction to principles and procedures. *Journal of Computing in Higher Education*, 26(1), 69-86. doi:10.1007/s12528-014-9078-x
- O'Connor, S., & Andrews, T. (2015). Mobile technology and its use in clinical nursing education: A literature review. *Journal of Nursing Education*, 54(3), 137-144. doi:10.3928/01484834-20150218-01
- Papp, C., Deeb, R. S., Booth, C., El-Sayed, A., & Freilicher, T. (2018). Bridging medical simulation with computer science and engineering: A growing field of study. *Nurse Education Today*, 71, 1-6. doi:10.1016/j.nedt.2018.08.011
- Patton, M. Q. (2015). *Qualitative research & evaluation methods* (4th ed., Rev.). Thousand Oaks, CA: SAGE Publications Ltd.
- Piryani, R. M., Piryani, S., Shrestha, U., Acharya, A., Kansakar, S., Shahi, M., . . . Bajracharya, S. R. (2019). Simulation-based education workshop: Perceptions of participants. *Advances in Medical Education and Practice*, 10, 547-554. doi:10.2147/amep.s204816.
- Price, A. M., Devis, K., LeMoine, G., Crouch, S., South, N., & Hossain, R. (2018). First year nursing students use of social media within education: Results of a survey. *Nurse Education Today*, 61(2018), 70-76. doi:10.1016/j.nedt.2017.10.013
- Raman, J. (2015). Mobile technology in nursing education: Where do we go from here? A review of the literature. *Nurse Education Today*, 35, 663-672. doi:10.1016/j.nedt.2015.01.018
- Sabio, C. & Petges, N. (2019). A framework for educator storytelling. *Nurse Educator*, 44(4), 207–210. doi:10.1097/NNE.0000000000000588

- Schwarb, H., Nail, J., & Schumacher, E. H. (2016). Working memory training improves visual short-term memory capacity. *Psychological Research*, 80(1), 128-148. doi:10.1007/s00426-015-0648-y
- Shah, D. K., Ram, L. Y., Sharma, D., Yadav, P. K., Niraj, K. S., Jha, R. K., & Islam, M. N. (2016). Learning approach among health sciences students in a medical college in Nepal: A cross-sectional study. *Advances in Medical Education and Practice*, 7, 137-143. doi:10.2147/AMEP.S109646
- Skiba, D. J. (2017). Students, technology, and teaching: Findings from the 2016 ECAR report. *Nursing Education Perspectives*, 38(1), 51-52. doi:10.1097/01.NEP.0000000000000117
- Smart, D., Ross, K., Carollo, S., & Williams-Gilbert, W. (2020). Contextualizing instructional technology to the demands of nursing education. *CIN: Computers, Informatics, Nursing*, 38(1), 18-27. doi:10.1097/CIN.0000000000000565
- Spies, C., Seale, L., & Botma, Y. (2015). Adult learning: What nurse educators need to know about mature students. *Curationis*, 38(2), 1-9. doi:10.4102/curationis.v38i2.1494
- Strand, I., Gulbrandsen, L., Slettebo, A., & Naden, D. (2017). Digital recording as a teaching and learning method in the skills laboratory. *Journal of Clinical Nursing*, 26(17-18), 2572-2582. doi:10.1111/jocn.13632
- Stec, M., Bauer, M., Hopgood, D., & Beery, T. (2018). Adaptation to a curriculum delivered via iPad: The challenge of being early adopters. *Technology, Knowledge and Learning*, 23(1), 109-127. doi:10.1007/s10758-017-9301-8
- Sundler, A. J., Pettersson, A., & Berglund, M. (2015). Undergraduate nursing students' experiences when examining nursing skills in clinical simulation laboratories with high-fidelity patient simulators: A phenomenological research study. *Nurse Education Today*, 35, 1257-1261. doi:10.1016/j.nedt.2015.04.008
- Tang, Y., & Barnett-Ellis, P. (2017). Nursing students' learning experience with E-books. *The Journal of Academic Librarianship*, 43(1), 67-71. doi:10.1016/j.acalib.2016.08.020
- U.S. Department of Health & Human Services. (2020). *Health information privacy home*. Retrieved from <https://www.hhs.gov/hipaa/index.html>
- Van Graan, A. C., Williams, M. J., & Korn, M. P. (2016). Professional nurses' understanding clinical judgment: A contextual inquiry. *Health SA Gesondheid*, 21(1), 280-293. doi:10.1016/j.hsag.2016.04.001
- Vezeau, T. M. (2016). In defense of clinical conferences in clinical nursing education. *Nurse Education in Practice*, 16(1), 269-273. doi:10.1016/j.nepr.2015.10.006

- Victor, J., Havrilla, E. & Zbegner, D. A. (2019). Game show–themed games for NCLEX-RN preparation. *Nurse Educator*, 44(5), 232–234. doi:10.1097/NNE.0000000000000655.
- Vogt, M. A., & Schaffner, B. H. (2016). Evaluating interactive technology for an evolving case study on learning and satisfaction of graduate nursing students. *Nurse Education in Practice*, 19, 79-83. doi:10.1016/j.nepr.2016.05.006
- Watson, B., Cooke, M., & Walker, R. (2016). Using Facebook to enhance commencing student confidence in clinical skill development: A phenomenological hermeneutic study. *Nurse Education Today*, 36, 64-69. doi:10.1016/j.nedt.2015.07.019
- Weeks, K. W., Coben, D., O'Neill, D., Jones, A., Weeks, A., Brown, M., & Pontin, D. (2019). Developing and integrating nursing competence through authentic technology-enhanced clinical simulation education: Pedagogies for reconceptualising the theory-practice gap. *Nurse Education in Practice*, 37, 29-38. doi:10.1016/j.nepr.2019.04.010
- Wittmann-Price, R., Godshall, M., & Wilson, L. (2017). *Certified nurse educator (CNE) review manual* (3rd ed.). New York, NY: Springer Publishing Company.
- Wu, T., Huang, Y., Su, C., Chang, L., & Lu, Y. C. (2018). Application and analysis of a mobile e-book system based on project-based learning in community health nursing practice courses. *Educational Technology & Society*, 21(4), 143-156. Retrieved from <https://www.jstor.org/journal/jeductechsoci>
- Yeom, Y., Miller, M. A., & Delp, R. (2018). Constructing a teaching philosophy: Aligning beliefs, theories, and practice. *Teaching and Learning in Nursing*, 13(3), 131-134. doi:10.1016/j.teln.2018.01.004
- Young, D., & Seibenhener, S. (2018). Preferred teaching strategies for students in an Associate of Science nursing program. *Teaching and Learning in Nursing*, 13(1), 41–45. doi:10.1016/j.teln.2017.09.005