THE EFFECT OF DELIBERATE PRACTICE COMBINED WITH HIGH-FIDELITY SIMULATION SCENARIOS ON PSYCHOMOTOR SKILL COMPETENCY AND RETENTION IN PRELICENSURE NURSING EDUCATION:

A MIXED METHODS PILOT STUDY

by

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A Dissertation Submitted to the Graduate Faculty of Georgia Baptist College of Nursing of Mercer University in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

Atlanta, GA
2016
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ACKNOWLEDGMENTS

My dissertation journey has been a fulfilling yet challenging accomplishment. I would like to thank my dissertation chair, Dr. Laura Kimble, for her unfailing advice, support, and for giving me the confidence to succeed. I would also thank, Dr. Susan Gunby, my dissertation internal committee member for sharing her knowledge and expertise to help guide me along the way. I would also like thank my external committee member, Dr. Alison Davis, for her input and advice.

I would also like to thank my husband and three children who supported my educational journey. They took care of me and allowed me the opportunity to pursue a passion and follow my dreams. I am thankful for my supportive and cohesive cohort, Becca, Modupe, Sarah, and Stacey, as we supported each other along the way. Special thanks to my best friend, Becca, who has always been there for me and who provided me with the support, friendship, and invaluable assistance to finish successfully.
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Graduating students who are proficient in the representative skills of nursing are vital for providing safe, quality patient care. The purpose of this pilot mixed method study was to examine the combined effect of deliberate skill practice prior to high-fidelity simulation (HFS) sessions and skill practice during HFS scenarios of the urinary catheter insertion skill on psychomotor skill competency and retention in prelicensure nursing students.

The study was based on Ericsson’s framework of deliberate practice for skill acquisition and expert performance. Using a randomized controlled experimental design, a convenience sample of 28 senior level prelicensure nursing students (mean age 21.82, SD 2.9, 96% Caucasian) were randomized into one of three groups. Each group participated in four, five-hour HFS scenario sessions with three different teaching methodologies. The control group (Group A) participated in the traditional HFS education method and no skill practice occurred. The second group (Group B) participated in deliberate practice of a different previously learned skill prior to each
session. Then Group B participated in HFS scenarios in which the urinary catheter insertion skill was performed. Group C participated in deliberate practice of the urinary catheter insertion skill prior to each HFS session and then performed the urinary catheter insertion skill during each HFS scenario. Quantitative data collection consisted of a urinary catheter insertion pre-test skill competency assessment, a post-test skill competency assessment, and a post-test skill retention assessment. Qualitative data collection with seven students occurred after the completion of the quantitative strand with face-to-face semi-structured interviews.

Results revealed no statistically significant difference in the groups on skill competency. However, the participants in the deliberate practice with HFS group (Group C) demonstrated an improvement in the overall total mean scores on urinary catheter insertion assessment and a medium eta effect size was found. Thus, the intervention of combining deliberate skill practice prior to HFS along with skill practice during HFS had a direct effect on the dependent variable (urinary catheter insertion competency assessment). In the qualitative strand, three themes were identified including Not the Best Place for Learning a Skill, Learning Skills with Peers, and Performing Skills for a Grade.

The qualitative data supported the quantitative findings and resulted in the discovery of the value of consistent peer to peer deliberate urinary catheter insertion practice prior to HFS scenario skill practice. This study provides preliminary data on the combination of deliberate peer to peer practice prior to HFS scenario skill practice may improve student urinary catheter insertion skill acquisition and retention. Because of the pilot nature of the study, the findings need to be confirmed in a larger clinical trial.
CHAPTER 1
INTRODUCTION TO THE STUDY

In 2003, the National League for Nursing (NLN) issued a position statement
emphasizing the importance of non-traditional innovative pedagogies to transform
nursing education. Subsequently, in 2005, the NLN released a new position statement
calling for a transformation of nursing education. Both of these position statements
addressed the need for nursing education to be based on best teaching practices which
integrate active participation of students during learning. Since this call for action, many
nursing schools have integrate high-fidelity simulation (HFS) as a teaching strategy (Cant
& Cooper, 2010; Davis, Kimble, & Gunby, 2014; Hayden, 2010; Hayden, Smiley, &
Gross, 2014; Weaver, 2011; Yuan, Williams, & Fang, 2012). High-fidelity simulation
enables students to acquire and refine problem solving and clinical skills, and learn
essential knowledge for safe and effective patient care in a supportive learning
environment without the possibility of patient harm (Bradley, 2006; Cannon-Diehl, 2009;
Cioffi, 2001; Decker, Sportsman, Puetz, & Billings, 2008; Elfrink, Kirkpatrick, Nininger,
& Schubert, 2010; Hammick, Freeth, Koppel, Reeves, & Barr, 2007; Institute of
Medicine [IOM], 2011; Lapkin, Levett-Jones, & Gilligan, 2013; Lewis, Strachan, &
Smith, 2012).

Best practices for HFS includes the use of clearly defined learning objectives for
scenarios based upon the students’ level of knowledge. These objectives serve as a guide
for providing a realistic learning environment to prepare students for clinical situations in which a combination of skills may be necessary (Garrett, MacPhee, & Jackson, 2010; Harder, 2010; Lioce et al., 2013; Rhodes & Curran, 2005). The learning objectives also assist in determining if the desired outcomes are achieved through the HFS learning experience (Lioce et al., 2013).

Multiple regulatory bodies, such as the American Association of Colleges of Nursing and the Society for Simulation in Healthcare, have endorsed the utilization of HFS in education and have embraced the establishment of standards for the delivery of simulation-based education (Agency for Healthcare Research and Quality, 2013; Cannon-Diehl, 2009; Foronda, Liu, & Bauman, 2013; Qayumi et al., 2012). The accreditation standards of the Society for Simulation in Healthcare (SSH) were created to provide guidance and promote excellence in interprofessional health care education, practice, advocacy, and research through a variety of simulation modalities (SSH, 2011). The International Nursing Association for Clinical Simulation and Learning (INACSL) developed standards for best practice in simulation in 2011. Specifically, the INACSL Standards of Best Practice: SimulationSM provide evidence-based best practices related to simulation implementation and training in seven areas encompassing terminology, professional integrity of participants, participant objectives, facilitation methods, simulation facilitator, the debriefing process, and evaluation of expected outcomes (Sando, Faragher, Boese, & Decker, 2011).

The use of developed standards, within and outside the nursing profession, ensures best practices related to simulation are incorporated within HFS experiences
Moreover, the use of these standards provides a well-grounded, best practice framework on which to build high quality HFS experiences which can lead to enhanced patient safety and improved quality of care (Borum, 2013; Cannon-Diehl, 2009). Additionally, HFS based on these international standards can provide an experiential learning opportunity to enhance knowledge and further develop clinical judgment and critical thinking skills (Decker et al., 2013).

International Nursing Association for Clinical Simulation and Learning standard one reviews the need for standard terminology to provide consistent effective communication between participants and facilitators (Meakim et al., 2013). Standard two, professional integrity of participants, describes the importance of mutual respect, professionalism, the critical need for confidentiality of the scenario, and for participants to provide and receive constructive feedback during the scenario and debriefing (Gloe et al., 2013). Standard three, which is related to participant objectives, identifies clear objectives as being essential to guide the scenario, fidelity, and facilitation (Lioce et al., 2013). The use of clear objectives also includes indicators to assist in determining if desired outcomes have been achieved (Lioce et al., 2013). Standard four, facilitation, focuses on the use of methods of facilitation congruent with the simulation objectives and expected outcomes (Franklin et al., 2013). Standard five, facilitator expertise, emphasizes the critical need for facilitator competency in clearly communicating objectives and outcomes, providing a safe, learning environment, using appropriate facilitation methods to foster learning, and modeling professional integrity (Boese et al., 2013). Standard six, the debriefing process, affirms all simulation should include a
planned debriefing session to review the content, promote understanding, and provide an
opportunity for reflective thinking (Decker et al., 2013). Standard seven, participant
assessment and evaluation, supports the use of simulation for assessment or evaluation of
psychomotor skills (Sando et al., 2013). Together these standards provide a quality
framework for best practices during HFS.

More recently, in 2013, the Agency for Healthcare Research and Quality (AHRQ)
added to the call for transformation by recommending the incorporation of HFS in
healthcare education. The AHRQ released a report titled Making Healthcare Safer II
which emphasized the importance of education utilizing HFS to reduce errors and
improve patient safety. The report supported the need for HFS, which incorporates the
standards of best practice, to improve care and develop clinical expertise and mastery
within a healthcare specialty (AHRQ, 2013; McGaghie, Issenberg, Cohen, Barsuk, &
Wayne, 2011). The report also emphasized the strategy of combining deliberate practice
with traditional training models as a way to obtain and maintain clinical proficiency in
students and clinicians. Current evidence within medical healthcare specialties suggests
HFS combined with increased technical and procedural performance, or deliberate
practice, can be utilized to achieve and maintain clinical expertise and competence in
skills (AHRQ, 2013).

Deliberate Practice

The concept of deliberate practice is grounded in skill acquisition and
maintenance with the goal of producing competent practitioners (Gifford & Fall, 2014;
McGaghie et al., 2011). Deliberate practice is defined as the application of the concept of
superior expert performance as applied to skill acquisition and professional development (Ericsson, 2006). Historically, in expert performance studies of physicians and nurses, expertise in these fields was identified by years of experience and peer nomination (Ericsson, 2008). In 1993, Ericsson, Krampe, and Tesch-Romer posited the development of expert practice was instead dependent on the individual's efforts to improve performance along with several other factors. Multiple studies, cited by Ericsson related to expert performance, showed even motivated people with repeated opportunities to perform a task did not always demonstrate expert performance (Ericsson et al., 1993). Therefore, expert performance research was redirected from studying labeled experts in a particular field to focusing on how expert performance is acquired and maintained (Ericsson, 2004).

To study expert performance in any field, representative tasks which define expertise in the domain must first be identified (Ericsson, 2004). In addition, these representative tasks must be reproducible in a consistent manner in order to be measured and provide scientific, verifiable evidence of expertise (Ericsson, 2004). Consistent training activities in various fields, such as sports and dance, associated with steady improvement in performance have been identified and these characteristics delineated as deliberate practice (Ericsson, 2004). Deliberate practice provides participants with a defined goal, which typically would be to become an expert in a specific skill, an opportunity for correction of mistakes with immediate feedback, and multiple opportunities for repetition of the tasks with gradual refinement and problem-solving abilities (Ericsson, 2004, 2007).
Deliberate Practice and Medical Education

As early as 1999, the use of simulation technology with deliberate practice was recommended for mastery of specific task-based training in medical schools (Issenberg et al., 1999). One study focused on the acquisition of mastery in laparoscopic skills using simulation technology in a controlled, standardized environment before residents performed the procedure on patients (Issenberg et al., 1999). The study found surgical residents who trained with a simulator showed significantly greater mastery of skills after repeated practice. This finding led to the recommendation of simulation training with repeated practice, instead of the traditional apprenticeship, prior to residents performing invasive techniques on patients (Issenberg et al., 1999). Another multi-site study using Harvey®, the cardiology patient simulator, found residents who used this simulator for training of cardiac examination skills, as compared to traditional training, performed significantly better on these skills in the post-tests (Ewy et al., 1987). These initial studies suggested skills learning on task simulators could be transferable to patients with the potential of providing medical students with increased skill performance in providing patient care (Issenberg et al., 1999).

In 2007, Ericsson conducted a translational research review related to the present state of research on medical expertise and the study of expert performance in clinical practice. In this review, Ericsson recommended the use of the expert performance approach along with HFS for the study of clinical performance in medical education (Ericsson, 2007). Furthermore, recommendations were made for the development of medical educational strategies, based on the expert performance model development, to
include HFS training with a known course of action and mastery skill learning with opportunities for feedback, reflection, and repetition of the skill to a certain predetermined level of mastery (Ericsson, 2007; McGaghie, 2008). These recommendations led to the call for new research on the combination of deliberate practice and simulation-based medical education (SBME) as an improved pathway for continuous development of skill and knowledge (McGaghie, 2008).

Based on Ericsson’s recommendation (2007), researchers in medical schools over the last ten years have conducted research aimed at deliberate practice combined with either skills training or simulation-based medical education (SBME) as a way to acquire and then improve clinical skills and patient care practice (Causer, Barach, & Williams, 2014; Duvivier et al., 2011; Kulasegaram, Grierson, & Norman, 2013; McGaghie et al., 2011). Duvivier et al. (2011) examined the effect of deliberate practice on medical students’ skill acquisition, the use of deliberate practice across the years of study, and the predictive value of deliberate practice on Objective Structured Clinical Examinations (OSCE). The quantitative, cross-sectional, retrospective study demonstrated a gradual, consistent improvement in clinical skills and OSCE results over the first three years of skill training in medical school (Duvivier et al., 2011). A systematic review of research comparing traditional clinical education versus SBME with deliberate practice demonstrated SBME with deliberate practice superior in the acquisition of multiple medical skills including advanced cardiac life support, laparoscopic surgery, cardiac auscultation skills, hemodialysis catheter insertion, thoracentesis, and central line insertion (McGaghie et al., 2011). Multiple studies, with medical students, have
demonstrated that deliberate practice of specific tasks has a positive effect on competency in clinical skills (Barsuk, Cohen, Feinglass, McGaghie, & Wayne, 2009; Butter, McGaghie, Cohen, Kaye, & Wayne, 2010; Duvivier et al., 2011; Gifford & Fall, 2014; McGaghie et al., 2011; Moulaert, Verwijnen, Rikers, & Scherbier, 2004; Wayne et al., 2006).

In addition, research focused on the combination of deliberate practice with HFS added to the traditional medical training model has demonstrated enhanced clinician technical performance (AHRQ, 2013; Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005; Kneebone, 2005; McGaghie et al., 2011). In contrast, few studies have explored the concept of deliberate practice and skill acquisition or deliberate practice combined with HFS for pre-licensure nursing students (Clapper & Kardong-Edgren, 2012; Liou, Chang, Tsai, & Cheng, 2013; Oermann, 2011). High-fidelity simulation-based education, combined with deliberate practice, has the potential to bridge the gap between theory and practice, thus, improving skill performance and increasing expertise in nursing students (Clapper & Kardong-Edgren, 2012; Liou et al., 2013; Oermann, 2011; Oermann, Kardong-Edgren, & Odom-Maryon, 2011).

The IOM in 2011 stated “At no time in recent history has there been a greater need for research on nursing education” (p. 227). Furthermore, the IOM (2011) called for new approaches and models of education to be embedded in the pre-licensure nursing curriculum including the use of simulation. To answer the call for research in nursing education and more innovative teaching strategies, the researcher implemented the current research study to investigate the use of deliberate practice combined with high-
fidelity simulation as an educational method to improve skill competency and retention in prelicensure nursing students.

Statement of the Problem

The use of simulation has been the most significant and widespread change in nursing education over the past ten years (Oermann, 2014). The results of the National Council of State Boards of Nursing (NCSBN) national simulation survey in 2010 confirmed the extent to which simulation has become embedded in nursing education (Cannon-Diehl, 2009; Hayden, 2010). The survey results (1060 programs from all 50 states participated) indicated 87% of responding nursing schools utilized high or medium fidelity simulation with more than half of the respondents requiring mandatory simulation scenarios for all students (Hayden, 2010; Kardong-Edgren, Willhaus, Bennett, & Hayden, 2012). The mandatory simulation scenario requirement is supported by research in nursing students demonstrating improvement in multiple areas after simulation-based education such as knowledge, technical skills, confidence/self-efficacy, and critical thinking skills (Cant & Cooper, 2010; Casida & Shpakoff, 2012; Fero et al., 2010; Foronda et al., 2013; Hope, Garside, & Prescott, 2011; Yuan et al., 2012). In addition, research has shown students are more satisfied when their learning experiences include simulation (Foronda et al., 2013; Hope et al., 2011; Jeffries & Rizzolo, 2006; Mills et al., 2014; Nehring & Lashley, 2009; Weaver, 2011; Wotten, Davis, Button, & Kelton, 2010).

Simulation education is continuously growing with more healthcare educators identifying the pedagogies of simulation leading to best practices and effective learning (Benner, Sutphen, Leonard, & Day, 2010; Hayden et al., 2014; Motola, Devine, Chung,
Sullivan, & Issenberg, 2013). Recent developmental research focusing on the features and best practices of SBME challenged educators to include demonstration of competencies to ensure quality patient care (Casida & Shpakoff, 2012; McGaghie, Issenberg, Petrusa, & Scalese, 2010). Results of studies utilizing HFS to teach cognitive, psychomotor, and affective skills to medical students demonstrated repetitive practice of psychomotor skills was associated with improved learner outcomes (Issenberg et al., 1999; Issenberg et al., 2005; McGaghie, Issenberg, Petrusa, & Scalese, 2006; Motola et al., 2013; Oermann et al., 2011). While HFS is commonplace in medical education now, this research-based recommendation has produced a cultural shift to include a greater focus on the acquisition of clinical competence (Wang, 2011).

Historically in nursing education, certain psychomotor skills have been considered essential, such as administration of medication, central line care, and urinary catheter insertion. The use of deliberate practice combined with HFS in nursing education can provide the opportunity for adequate acquisition, assessment, and retention of skill competence in the skills of nursing (Cannon-Diehl, 2009; Ericsson, 2007; Ericsson, Whyte, & Ward, 2007). The ability to perform certain nursing skills and procedures is a critical outcome of nursing education as skill performance is directly related to patient safety. This outcome has not been systematically addressed by the nursing community despite existing studies with nurse managers and new graduates reporting a lack of skill competency readiness for entry-level practice (Nehring, 2010a; Oermann, 2011). A need exists in nursing education for a standard format to measure, assess, and maintain competency in certain representative tasks of nursing such as
intravenous catheter insertion, central line care, and urinary catheter insertion (Chee, 2014; Nehring, 2010a). Nursing schools need to focus on students achieving competence in frequently used clinical skills and provide opportunities for deliberate practice of these skills throughout the curriculum (Oermann, 2011). Additionally, practice can be integrated into HFS scenarios which have been found to assist nursing students in becoming familiar with the nursing process and acquiring skills in a safe, non-threatening environment (Dubose, Sellinger-Karmel, & Scoloveno, 2010). This practice will allow students the opportunity to consistently refine and develop expertise in these skills (Chee, 2014; Oermann, 2011).

Because HFS is now commonplace in nursing education, the combination of deliberate practice and HFS has the potential to strengthen this learner-focused, evidenced-based educational pedagogy by focusing on best practices on how to acquire and retain skill competency. The deliberate practice concept is based on the measurable performance of reproducible tasks of nursing performed under similar conditions and analysis of data (Chee, 2014). High-fidelity simulation provides a bridge between learning tasks and practicing the skills of nursing during scenarios and then performing the skills on actual patients (Ackermann, 2009; Oermann et al., 2011). Recent nursing articles have suggested deliberate practice can be used to enhance the simulation experience in developing skill specific competency in nursing students (Clapper & Kardong-Edgren, 2012; Ericsson et al., 2007; Oermann et al., 2011; Oermann et al., 2015; Whyte & Cormier, 2014). Since the only practice after traditional skill checkoffs may be during HFS, the incorporation of this best practice in simulation has the potential
to embed student competency development in nursing education and provide better prepared graduates.

Purpose of the Study

The purpose of this pilot study was to use a convergent parallel mixed methods design to test the effect of deliberate practice combined with HFS scenarios on urinary catheter insertion skill competency and retention in pre-licensure baccalaureate nursing students.

Research Questions

The study addressed the following research questions:

Quantitative Research Questions:
Research question 1. Do pre-licensure baccalaureate nursing students in the deliberate practice combined with HFS group demonstrate greater skill competency in urinary catheter insertion than students in the traditional HFS scenario group and HFS with skill integration group?
Research question 2. Do pre-licensure baccalaureate nursing students in the deliberate practice combined with HFS group demonstrate greater skill retention in urinary catheter insertion than students in the traditional HFS scenario group and HFS with skill integration group?

Qualitative Research Question:
Research question 3. What are pre-licensure nursing students’ perceptions of the effectiveness of deliberate practice on urinary catheter insertion skill competency and retention?
Research question 4. Do prelicensure nursing students’ perceptions of deliberate practice explain the quantitative results of the study?

Conceptual Framework

To guide best practices in the use of simulation in nursing education, several frameworks have been proposed in recent years (Jeffries, 2005; Jeffries & Rogers, 2007; Nehring, 2010b; Waldner & Olson, 2007). The NLN/Jeffries simulation framework, is composed of five components consisting of facilitator and participant factors, educational practices, design characteristics, and outcomes (Jeffries & Rogers, 2012). Other theoretical frameworks for simulation in nursing education have included the incorporation of Benner’s novice to expert theory, Kolb’s experiential learning theory, and Schön’s theory of reflective thinking (Nehring, 2010b). Many essential concepts in these frameworks are relevant for understanding the development of skill proficiency in nursing education, but none provide a comprehensive outline to improve skill performance, develop expertise, and promote skill retention. Therefore, the framework for this study was based on Ericsson’s framework of deliberate practice and acquisition of expert performance. Repetitive practice or deliberate practice, as it is known in the literature, is a concept based on research pioneered by Ericsson on the study and acquisition of expert performance. Deliberate practice involves skills practice which is “uniformly associated with improved performance” (Ericsson, 2008, p. 991).

In the 1990s, Ericsson began exploring how expert performance is obtained and measured in various professions such as chess, music, and individual event sports. Ericsson et al. (1993) proposed the acquisition of skill competency and retention is based
on repeated application and use of knowledge over an extended period of time. This growth in skill competency is not obtained through ordinary repetition of skills but through a focused, deliberate effort on improvement in performance (Ericsson et al., 1993). The characteristics of deliberate practice include goal-directed training, immediate feedback, and opportunities for repetition, monitoring, and self-reflection (Ericsson, 2007).

The engagement of deliberate practice in learning and improving skill competency involves not a "passive accumulation of experience but mediated by active engagement . . . to monitor, control, and refine performance" (Ericsson et al., 2007, p. E68). Ericsson (2007) posited competency on technical procedure training in medical students could be obtained through the use of deliberate practice for skill development. When incorporating deliberate practice for skill acquisition and retention, the first fundamental phase is defining the essence or skills of the domain (Ericsson, 2004; Ericsson et al., 2007). These skills must be standardized and be presented to novice and experts under similar conditions (Issenberg et al., 1999; Ericsson et al., 2007). Skills or representative tasks in nursing education can be delineated as those psychomotor skills traditionally begun in the first year of nursing education such as administration of medication, intravenous catheter insertion, central line care, and urinary catheter insertion. These skills or representative tasks in nursing correlate with the nursing-sensitive indicators delineated in the National Database of Nursing Quality Indicators (NDNQI) maintained by the National Quality Forum (Chee, 2014; Montalvo, 2007). The mission of this forum is to demonstrate the value of nurses in promoting quality patient
care (Montalvo, 2007). This study focused on the representative task of urinary catheter insertion and followed the techniques for urinary catheter insertion as delineated in the 2009 Center for Disease Control’s (CDC) guidelines for prevention of catheter-associated urinary tract infections.

In learning and practicing skills, students progress through three phases of skill development defined as cognitive, associative, and autonomous (Fitts & Posner, 1967; Schmidt & Lee, 2005). In the cognitive phase, the learner understands what to do (Huber, 2013; Schmidt & Lee, 2005). In the associative or motor phase, the learner attempts to translate learned knowledge into procedural knowledge (Huber, 2013; Schmidt & Lee, 2005). The final or autonomous phase is when motor performance becomes more automatic with less cognitive demand (Huber, 2013, Schmidt & Lee, 2005).

The second phase in deliberate practice builds upon the autonomous phase by developing skill competency through focused repetition to refine behavior (Ericsson, 2004). In this phase, a facilitator provides detailed immediate feedback on the student’s performance (Ericsson, 2004). Finally, iterative practice is provided with time for problem solving and evaluation so the student can improve performance gradually through focused, active participation in the learning process (Ericsson, 2004).

To achieve and maintain skills proficiency, students need to engage in the essential components of deliberate practice including repetitive performance, rigorous assessment, and specific feedback (Ericsson, 2004; Ericsson et al., 1993; McGaghie et al., 2010; Oermann, 2011). Ericsson (2004) argued that deliberate practice may allow
students to not only improve performance, but also maintain a current level of performance until graduation. The expert performance approach is an evidence-based framework for measuring and analyzing superior performance in various domains such as chess, sports, music, and business (Causer et al., 2014; Ericsson, 2007; Moulaert et al., 2004). Initial studies from medicine and nursing have demonstrated the relationship between expert performance and deliberate practice involving the development of task-specific knowledge, focused practice with repetition of skills, and valid, immediate feedback leading to improvement in skill performance (Causer et al., 2014; Duvivier et al., 2011; Ericsson et al., 2007; Moulaert et al., 2004; Oermann et al., 2011). Ericsson's framework provided a strong basis for the research and was utilized to guide the content of the combined deliberate practice and HFS scenario intervention in this study.

Significance of the Study

The National Council of State Boards of Nursing (NCSBN) in 2014 released the results of a national, multi-site, longitudinal study of simulation use in prelicensure nursing programs across the United States. The large-scale, randomized, controlled study was conducted to obtain research-based evidence to provide guidelines for nursing programs which sought to replace traditional clinical time with simulation (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014). The NCSBN study provided outcome data on the effectiveness of simulation including the use of medium or high fidelity manikins, standardized patients, role playing, skills stations, and computer-based critical thinking simulations (Hayden et al., 2014). The researchers, in this landmark study, found no significant differences in nursing knowledge and clinical instructor
ratings of competency when simulation experiences replaced a portion of traditional 
clinical hours. In addition, no significant difference was demonstrated between new 
graduates in the traditional clinical groups and the groups who substituted HFS for 
clinical hours when surveyed about acclimating to the nursing profession and self-
assessment ratings of clinical knowledge and skills. One limitation of this study was the 
assessment of competency in technical skills was subjectively rated by the student, 
clinical instructor, new graduate, or manager. No objective measurement of skill 
acquisition or expertise was completed (Hayden et al., 2014). Based on the lack of 
current research on deliberate practice in nursing, the current study assisted in expanding 
the current research about the effectiveness of HFS in nursing education through the use 
of deliberate practice for urinary catheter insertion skill practice combined with the 
incorporation of the urinary catheter insertion skill into HFS scenarios for competency 
and retention of skill expertise.

The selection of urinary catheter insertion as the skill of interest for the study was 
based on the classification of urinary tract infections as a nursing-sensitive indicator by 
the NDNQI and current literature indicating an essential need to reduce the number of 
urinary catheter infections in hospitalized patients. Urinary catheter infections are one of 
five of the most prevalent types of healthcare-associated infections (HAI) and account for 
25% of all hospital HAIs (Association for Professionals in Infection Control and 
Epidemiology [APIC], 2014). The cumulative cost of urinary catheter associated 
infections is a substantial burden in multiple facilities throughout the healthcare 
community including acute-care and long-term care facilities (APIC, 2014). The APIC
(2014) report emphasized the use of aseptic technique during the insertion of urinary catheters to successfully reduce the amount of catheter-associated urinary tract infections (CAUTI) in the healthcare setting (APIC, 2014). In addition, the need for annual competencies for aseptic insertion is recommended as a key prevention strategy for identifying gaps in knowledge and skill as part of a complete CAUTI prevention program (APIC, 2014).

Because aseptic catheter insertion is one of the essential elements for prevention of CAUTI, urinary catheterization should be completed only by trained healthcare professionals to ensure proper aseptic insertion and maintenance (Chenoweth & Saint, 2011; Gonzalez & Sole, 2014). Therefore, it is imperative that nursing students obtain competency in the skill of urinary catheter insertion prior to graduation to be able to provide safe, quality patient care (Gonzalez & Sole, 2014). In addition, the performance of psychomotor skills in an HFS environment, which includes distractions and the need to set priorities, allows the students to contextually apply these learned skills (DeBourgh, 2011). Strengthening the research evidence for how to measurably improve skills performance is critical for improved skill acquisition and maintenance in new nursing graduates (Cockerman, Figueroa-Altmann, Eyster, Ross, & Salamy, 2011; Martin & Wilson, 2011; Welding, 2011). The embedding of deliberate practice into HFS scenarios may result in graduate nursing students who demonstrate greater competency in the basic skills or tasks representative of nursing.

Despite the paradigm shift taking place in medical education regarding the increased use of deliberate practice, nursing education has not yet embraced the concepts
of deliberate practice into the prelicensure curriculum. Few studies in nursing education have focused on the incorporation of deliberate practice and HFS. Defining and delineating adequate assessment of skill competency has been a struggle in nursing and nursing education (Ericsson, 2007). In addition, the instruction of skills in nursing education has received little attention “even though nurse managers and new graduates often report a lack of skill competency upon entry into practice” (Oermann, 2011, p. 63). A need exists in prelicensure nursing education to find evidence-based methods to strengthen skill acquisition and maintenance and to graduate nurses who report skill competency readiness and are deemed competent for entry into practice by employers. The current study provided a framework of evidence to support this recommendation.

The current emphasis on patient safety and quality care mandated in healthcare provides further support for an investigation of the use of deliberate practice and HFS in nursing education (Casida & Shpakoff, 2012; Fero et al., 2010). This goal was further underscored by the IOM report in 2003 which detailed the importance of healthcare education in achieving national quality and safety goals. Pre-licensure nursing programs need to graduate nurses who can transition into full-time practice, demonstrate competency in essential nursing tasks, and provide safe, effective care (Casida & Shpakoff, 2012; Ironside, Jeffries, & Martin, 2009). Patient safety errors and sentinel events have been identified due to deficiencies in the ability of new graduates to transition into practice (Fero et al., 2010). Nursing competency plays a vital role in assuring patient safety (IOM, 2003). Innovative teaching methods such as deliberate practice combined with HFS have the potential for supporting the goal of integrating
quality and safety content into the curriculum and achieving competency in essential
knowledge and skills in nursing (Fero et al., 2010; Ironside et al., 2009).

Definition of Terms

Definitions of terms used in this study are as follows:

*High-fidelity simulation.* A teaching strategy incorporating a computerized full-
body manikin that can be programmed to provide realistic physiologic responses to a
practitioner’s actions; these simulations require a realistic environment and the use of
actual medical equipment and supplies (Cant & Cooper, 2010; Decker et al., 2008).

*Deliberate practice.* A highly structured activity with the explicit goal of
improving skill performance. Deliberate practice is progressive learning which includes
repetitive performance of cognitive or motor skills, rigorous assessment of those skills,
and specific instructional feedback on performance (Ericsson, 2004; Oermann, 2011).

*Skill.* An action which an individual performs in a competent way in order to
achieve a goal (Ericsson, 1996). A clear definition of the skills in nursing is not
available; however, the term “skills in nursing” encompasses the traditional skills taught
in nursing education such as intravenous catheter insertion, central line care, and urinary
catheter insertion.

*Skill competency.* An expected level of performance that results from an
integration of knowledge, skills, abilities, and judgment (American Nurses Association,
2007). Traditionally in nursing education, skill competency is measure through a one-
time checkoff and clinical practice deemed safe by a clinical instructor.
Skill retention. Skill retention is the ability to retain a competent performance level in skill over an extended period of time (Oermann, Kardong-Edgren, Odom-Maryon, & Roberts, 2014).

Clinical scenario. A plan for the expected course of events for a simulated clinical experience. The scenario provides the context and depends on the specific learning objectives (Meakim et al., 2013).

Competence. A combination of standardized skills, knowledge, and attitudes to properly perform a specific skill (American Nurses Association, 2007).

Traditional high-fidelity simulation scenario. The first of three intervention groups for the study. The scenario for this group utilized full scale computerized patient simulators which provided a high level of interactivity and realism for the learner (Meakim et al., 2013). This group represented the control group in the study and the group did not participate in deliberate practice of urinary catheter insertion and the insertion of a urinary catheter was not integrated into the HFS scenarios.

High-fidelity simulation scenario with skills integration. The second of three intervention groups for the study. This group participated in HFS scenarios using full scale computerized patient simulators which provided a high level of interactivity and realism for the learner (Meakim et al., 2013). In this group, the urinary catheter insertion skill was integrated into all the HFS scenarios. This group also practiced previously learned skills prior to each HFS session for 15-20 minutes excluding the urinary catheter insertion skill.
Deliberate practice combined with high-fidelity simulation scenarios. The third of three intervention groups for the study. In this group, urinary catheter insertion was practiced for 15-20 minutes prior to each HFS session. This group participated in HFS scenarios using full scale computerized patient simulators which provided a high level of interactivity and realism for the learner (Meakim et al., 2013) and the urinary catheter insertion skill was integrated into all the HFS scenarios.

Summary

In conclusion, nursing education must better prepare new graduates to “deliver patient-centered, equitable, safe, high-quality health care services” (IOM, 2011, p. xii). The need for research on best interactive teaching practices will expedite the critical transformation in nursing education required to better prepare graduates. As care within the hospital setting becomes more complex, nursing students must be able to develop and retain core competency nursing skills in order to transition into practice (IOM, 2011). Nursing education must adapt to the ever-changing complex healthcare environment and be an effective change agent by adapting new curricular models which encompass active, hands-on learning pedagogies. However, HFS is only one component in creating a more learner-centered, hands-on approach to education (Alinier, Hunt, Gordon, & Harwood, 2006; Cannon-Diehl, 2009). The IOM report in 2011 emphasized that a lack of evidence exists linking any specific number of clinical hours to improved student outcomes. Therefore, the report recommended a change in focus from clinical hours to demonstrated competencies. The incorporation of deliberate practice in HFS has the potential to meet this recommendation and provide a way for students to develop and retain certain
representative nursing skills. This transition will provide a smoother pathway for new graduates to transition into practice. At this time, a paucity of evidence exists supporting the use of deliberate practice with HFS in nursing education.

This chapter provided a summary of the statement of the problem, the purpose of the study, and its significance to nursing educational research. The conceptual framework based on the theory of deliberate practice was delineated and the need for incorporating deliberate practice throughout the nursing curriculum was explored. In addition, standards of best practice for HFS were outlined. The incorporation of deliberate practice with HFS scenarios was posited to have the potential to promote skills acquisition and maintenance in pre-licensure nursing students.
CHAPTER 2
REVIEW OF THE LITERATURE

The evolution of high-fidelity simulation (HFS) into healthcare education has made a historic impact on pre-licensure nursing education. This interactive pedagogy provides opportunities for students to link and apply knowledge learned in the classroom in a clinical context (Cant & Cooper, 2010). Multiple factors have influenced the rise of HFS in nursing education including the expectation of high quality, safe patient care, ethical considerations related to practicing on patients, technological advances in healthcare, higher patient acuities, and the need to reform healthcare education (Benner et al., 2010; Decker et al., 2008; Nehring, 2010b; Ross, 2012; Tanda & Denhem, 2009). These factors coupled with shorter average hospital stays and staff nurse shortages have resulted in limited teaching opportunities for students in clinical areas (Bloomfield, Roberts, & While, 2010; McNett, 2012; Ross, 2012; Tanda & Denhem, 2009). The shortage of staff nurses is also reflected in the lack of qualified clinical instructors to teach in the clinical setting (Benner et al., 2010). The critical need to graduate nurses with the skills and knowledge to practice safely upon transition to practice has also contributed to the growth of HFS (Bloomfield et al., 2010; McNett, 2012; Richardson & Claman, 2014).

The factors supporting the exponential growth of HFS in nursing education are directly linked to the need for integrating safety and quality into the nursing education
curriculum. The National Council for State Board of Nursing (NCSBN, 2005) declared one of the greatest challenges to healthcare is the attainment and maintenance of professional competence. Competent nursing requires skill competency to avoid causing harm to others. In order to practice safely, nursing students should be able to demonstrate competency in the psychomotor skills inherent to nursing (Nehring, 2010b). Changes need to be made in nursing education to allow pre-licensure nursing students to achieve competence in the performance of skills to promote optimal patient outcomes (Bloomfield et al., 2010; Clapper & Kardong-Edgren, 2012; Nehring, 2010b; Oermann, 2011).

In this chapter, the literature review includes an examination of how the evolution of expert performance acquisition and designation is defined in multiple fields including medicine and nursing. In addition, the rise of deliberate practice combined with simulation-based medical education (SBME) is examined with an emphasis on research related to the acquisition and retention of skills by medical residents. A review of the literature on skill acquisition and retention in nursing is also provided. Finally, a review of the literature focused on the use of deliberate practice combined with HFS for skill acquisition and retention in nursing education is provided and inferences for the current study are outlined.

Synthesis of Literature

Research into the role of deliberate practice in the acquisition of expert performance began with exploration into the concept of how exceptional performance is obtained and measured in certain fields (Ericsson et al., 1993). The lack of scientific
evidence supporting the development of expert performance, such as in medicine and
nursing, led to new studies on the habits of elite performers in areas such as music, chess,
and individual sports (Ericsson et al., 1993). As research on the attainment of expert
performance through deliberate practice progressed, a call for research focusing on the
use of this framework for clinical expertise in medical and nursing education was made.

Historical Background of Deliberate Practice

The British scientist, Galton, was the first to explore the characteristics leading to
expert performance in many fields (1869). He believed individuals became experts and
were recognized by their peers as such after a history of multiple achievements (Galton,
1869). After studying a relatively small sample group with many common ancestors, he
concluded expertise was pre-determined (Ericsson & Smith, 1991; Galton, 1869). Based
on these assumptions, Galton (1869) posited individual differences in performance were
limited by innate genetic factors such as mental and physical capacity. While Galton
(1869) acknowledged the importance of practice for improvement in motor performance
and studying for the improvement of mental powers, he believed maximal individual
performance in these areas was limited by genetic innate capacities. Without these
genetic traits, individual performance had an upper boundary with an impenetrable limit
and could not reach expert performance (Galton, 1869). The influence of Galton’s work
and his views on genetic influences and limitations on individual performance attainment
by a lack of inherited natural abilities is still a common belief today (Ericsson et al.,
1993).
A more contemporary view of skill acquisition built upon Galton’s general assumptions was posited by Fitts and Posner in 1967. This view adopted Galton’s general observations on basic performance levels and divided learning into three phases (Ericsson et al., 1993; Fitts & Posner, 1967). The first of the three phases of learning a task or skill is to understand the activity and perform the basic steps without making many mistakes (Fitts & Posner, 1967). In the second phase of learning, learners do not need to focus as intently on their performance, and noticeable mistakes are fewer as the learner attempts to maintain an acceptable level of performance (Fitts & Posner, 1967). The third phase of learning is the autonomous stage where skills become automated, and little concentration is needed to execute the skill at an acceptable performance level (Fitts & Posner, 1967). This third level is a stable plateau and is assumed to be the performance limit of the individual.

Simon and Chase (1973) further built upon this theory by proposing that expertise was based on extensive experience in a specific domain in which individuals were able to acquire new and more complex patterns of knowledge. Therefore, expert performance was postulated to be built through gradual performance improvement through multiple years spent in a domain; moreover, experts were considered to be individuals with years of experience who were able to develop acquired knowledge and problem solving by storing years of information in their long-term memory (Ericsson & Staszewski, 1989; Simon & Chase, 1973). In studies of human expertise related to chess and memory, expert performance was seen as related directly to years of experience in a specific
domain and obtained through the knowledge acquisition gained during this time (Ericsson & Staszewski, 1989; Simon & Chase, 1973).

Based on the observation of how experts used knowledge efficiently, research began to concentrate on the relationship between expert knowledge and how this knowledge was used to achieve exceptional performance (Ericsson & Staszewski, 1989). Chase and Ericsson’s skilled memory theory posited that expert performers developed acquired memory skills which enabled them to store and retrieve large amounts of information upon which to perform certain tasks or skills more proficiently and accurately over time (Ericsson & Staszewski, 1989). Thus, years of experience allowed experts to develop exceptional domain-specific memory capabilities as compared to novices (Ericsson & Staszewski, 1989). Based on this theory, scientists began to view expertise as an automatic consequence of individuals with over ten years of full-time experience in a domain (Ericsson, 2006). The primary factors, leading from novice to expert, were seen as instruction, training, and expertise (Ericsson, 2006). Based on these factors, experts were defined by peer nomination, completed education, and over ten years of accumulated knowledge and experience (Ericsson, 2006, 2008).

However, several studies found that individuals who were considered experts, based on extensive experience and by reputation among their peers, were occasionally found to be only average performers (Ericsson, 2006). Dawes, in 1994, found the length of training and professional experience of clinical psychologists did not accurately reflect their expertise and success in treating patients. Additional studies involving computer programmers, physics professors, software designers, wine experts, and financial
advisors found that individuals considered experts were not always superior in their field even when compared to novices (Dawes, 1994; Doane, Pellegrino, & Klatzky, 1990; Gawal, 1997; Reif & Allen, 1992; Shanteau & Stewart, 1992).

To address this contradiction, Ericsson and Smith (1991) proposed that experts in a specific domain should be delineated by their ability to replicate superior performance on representative, authentic tasks of their field. For athletes, expert performance can be illustrated through individual competitive sports (Ericsson, 2006). Similar situations of performance measures and competitions exist in the areas of music, dance, typing, and chess. Longitudinal studies of performance in these fields demonstrated all competitive individuals improved gradually over time with no evidence of any individuals possessing an innate ability to perform at a high level without experience or practice (Ericsson, 2006). Additionally, these studies found even the most talented individuals need at least ten years of experience in a specific domain before attaining an expert level. Many domains, such as music and science, require many years longer to develop expertise (Ericsson, 2006). Therefore, expert performance is not consistently obtained in all individuals despite years of work and experience in a specific domain (Ericsson & Lehmann, 1996).

Performance in sports has historically been measured under standardized conditions, thus it has been clearly demonstrated that performance in individual sports can continually improve over time (Ericsson et al., 1993). Improvements in training methods and equipment can account for some of the increases in performance; however, these factors cannot account for the individuals who reach only an acceptable level of
performance despite these advances (Ericsson, 2006). Musicians, dancers, and chess players have also historically competed under controlled conditions which provided identification of the best performers (Ericsson, 2006). In all of these examples, participants spent many hours in domain specific practice and training and have demonstrated expert performance in controlled, standardized tasks specific to their field (Ericsson, 2006).

In addition to the hours of domain specific training and practice, expert performers also demonstrated specific practice characteristics (Ericsson et al., 1993; Ericsson, 2006). Effective training involved sequentially more difficult tasks with specific end goals and monitoring by a teacher or coach (Ericsson et al., 1993; Ericsson, 2006). This concept termed “deliberate practice” required the participants to fully concentrate on improvement and refine their performance after immediate feedback (Ericsson et al., 1993; Ericsson, 2006). This concentrated practice with feedback is different from unfocused repetitive practice without interactive feedback and has been found to lead to expert performance (Ericsson et al., 1993; Ericsson, 2006). Therefore, the concept of deliberate practice is grounded in research which includes not only individual sports, dancers, musicians, and chess players but also writers, scientists, and mathematicians who achieved expertise in their fields (Ericsson et al., 1993).

Specific characteristics of experts engaged in deliberate practice have been identified and the most cited trait leading to performance improvement was found to be motivation and desire for improvement by the participant (Ericsson et al., 1993). Deliberate practice is highly structured practice designed to improve performance,
identify weaknesses, and provide feedback on how to improve. The training itself is not considered enjoyable, however, it is imperative to reach the final goal of expert performance (Ericsson et al., 1993).

To address the lack of empirical, translational science on the study of expertise, Ericsson and Smith (1991) proposed a conceptual framework on the characteristics of expert performance in a domain. The first phase in this framework was to distinguish the representative tasks of a specific domain which could be replicated (Ericsson & Smith, 1991). These representative tasks and the underlying cognitive processes could be analyzed and studied under relatively standardized, controlled conditions. Hence, the second phase was a detailed analysis of the representative tasks. The final phase in developing the framework of expert-performance approach was to evaluate the critical underpinning characteristics of the expert performer. Based on these three phases, research focused on the development of expert performance included understanding the role of knowledge acquisition as well as the effects of practice and training on the development of expertise in a specific domain (Ericsson & Smith, 1991). Deliberate practice is not simply more experience but the seeking of opportunities for repetition, immediate feedback with time for reflection and problem solving (Ericsson et al., 2007; Issenberg et al., 1999).

Deliberate Practice in Medical Education

Research involving expertise in the medical field in the past thirty years has focused primarily on the difference between novice (medical student) and expert (experienced clinician) cognitive problem solving process abilities and on the medical
professional’s ability to make accurate medical diagnoses (Ericsson, 2004, 2007). This research focus failed to identify medical professionals with “reproducibly superior performance” in their daily clinical practice and did not provide a distinction between experienced clinicians and clinicians with expert performance (Ericsson, 2007, p.1127).

Additionally, Choudhry, Fletcher, & Soumerai (2005) found, in a systematic review of the relationship between clinical experience and quality of health care by physicians, 52% of the research on clinical expertise reported an inverse relationship between experience and performance as a practitioner. This review also suggested in many cases, as years of experience increased, knowledge of current evidence-based practice decreased and therefore quality of care decreased (Choudhry et al., 2005).

Traditionally in medical education, skill competency was expected to be obtained in the clinical area after a one-time didactic education and skill training (Barsuk, Cohen, et al., 2009; Butter et al., 2010; McGaghie et al., 2011). Prior research on individual performance in medical education focused on certification of minimal assessment of competency and known acceptable medical practice (Ericsson, 2004). In 1999, Issenberg et al. published a report recommending the use of simulation technology for certain task based training such as surgical technical skills and cardiovascular examination skills. The use of these task simulators was recommended to ensure students had an opportunity for repeated practice and to develop some technical expertise before training on real patients (Issenberg et al., 1999). In addition, this report recommended the use of simulators throughout the medical education program to acquire and maintain skill expertise over time (Issenberg et al., 1999).
This identified need for improved skill assessment, training, and retention in medical education resulted in a paradigm shift with a change from traditional training toward competency-based medical education (Butter et al., 2010; Ericsson, 2004). The utilization of Ericsson’s expert-performance model of deliberate practice to measure demonstrable consistently competent performance in skills in medical education is leading this shift (Wang, 2011). Additionally, the use of deliberate practice combined with HFS to improve training in core medical skills development has been identified as an essential current trend in SBME to address this change (McGaghie et al., 2010). Recent research with medical students on this learner-centered approach revealed improved skill acquisition in cardiac auscultation, advanced cardiac life support, thoracentesis, lumbar puncture, and central catheter insertion after education featuring HFS and deliberate practice (Barsuk, Shubhada, Cohen, McGaghie, & Wayne, 2009; Butter et al., 2010; Conroy, Bond, Pheasant, & Ceccacci, 2010; Wayne et al., 2006; Wayne, Barsuk, O’Leary, Fudala, & McGaghie, 2008a). Participants in these studies first completed a pre-test to assess skill and knowledge, received education with time for deliberate practice with focused feedback, and then completed a post-test during a HFS scenario.

In addition, research on simulation in medical education suggests skills learned on a simulator are transferable to the patient care arena (Cook et al., 2011; Issenberg et al., 1999; Issenberg et al., 2005; McGaghie et al., 2010). Medical research findings have also shown high-fidelity simulation scenarios with repetitive practice are associated with improved learner outcomes in the areas of skill performance (McGaghie et al., 2006;
McGaghie et al., 2010). Current research on expert performance has shown repetitive practice has a more significant effect on expertise development than experience or natural ability than previously believed (Ericsson et al., 1993). A recent systematic review revealed the embedding of deliberate practice with HFS in medical education significantly improved clinicians’ knowledge and technical skill performance (McGaghie et al., 2011). Furthermore, additional medical education studies have shown significant improvement in clinical knowledge and various skill competencies when deliberate practice was incorporated with simulation during skill training (Barsuk, Cohen, et al., 2009; Barsuk, Shubhada, Cohen, McGaghie, & Wayne, 2009; Butter et al., 2010; Duvivier et al., 2011; McGaghie et al., 2011; Velmahos et al., 2004; Wayne et al., 2006). Additionally, several studies have linked repetitive skill practice with HFS to improved performance in the clinical setting as evidenced by better patient care outcomes (Barsuk, Cohen, et al., 2009; Barsuk, Shubhada, et al., 2009; Okuda et al., 2009; Wayne et al., 2008b).

As a result, deliberate practice for acquiring proficiency in skill acquisition is now considered best practice in medical education (Issenberg et al., 2005). In addition, deliberate practice has been delineated as one of the 12 best practices for SBME (McGaghie et al., 2010). When utilized in medical education, deliberate practice has been shown to have at least nine features: highly motivated learners, well-defined learning objectives, appropriate levels of difficulty, focused and repetitive practice, measureable skills, interactive feedback, learner engagement in the process, attainment of a mastery level, and advancement to another task or skill (McGaghie et al., 2010).
Deliberate practice as a key feature of medical educational programs to increase knowledge and skill acquisition can provide integrated training opportunities throughout the curriculum to achieve and maintain competence (McGaghie, 2008).

Skills Acquisition in Nursing Education

Medical errors and hospital acquired infections account for 200,000 deaths each year with nearly 100,000 from infections alone (Reed & Kemmerly, 2009). In addition, one in 25 patients have at least one hospital acquired infection resulting in approximately 75,000 deaths each year (Magill et al., 2014). Device associated infections, such as urinary catheters, accounted for 25.6% of all health care-associated infections in 2011 with urinary tract infection ranking as the fourth most common health care-associated infection in acute care hospitals (Magill et al., 2014). Failure of adherence to strict aseptic technique during urinary catheter insertion has been directly linked to an increase in catheter associated urinary tract infections (Chenoweth & Saint, 2011; Conway & Larson, 2012). One recent study demonstrated the traditional one time competency validation during the nursing curriculum is not enough to ensure skill competency or mastery in urinary catheterization skills (Gonzalez & Sole, 2014). These results highlighted current literature citing a majority of new graduate nurses do not have the skill competency to practice safely in this current high stakes environment (Bloomfield et al., 2010; Borneuf & Haigh, 2010; DeBourgh, 2011; Richardson & Claman, 2014).

Problems with the current practice of achieving skill competency in nursing students includes the ethics of practicing on patients, uncertain availability of quality clinical sites, nursing faculty to student ratio, and no standard identification of basic
nursing skills (Chee, 2014; Nehring, 2010b; Tanner, 2006). Another challenge is inconsistent clinical practice opportunities and experiences by nursing students in the hospital setting (Howard, Englert, Kameg, & Perozzi, 2011; Lasater, 2007; Moule, Wilford, Sales, & Lockyer, 2008). While many nursing programs have added HFS to the curriculum to address these issues, a gap still exists between nursing practice and nursing education with no current focus on the lack of basic skill competency acquisition and retention (Benner et al., 2010; Bloomfield et al., 2010; Tanner, 2006).

Even though the teaching of fundamental skills is a core component of nursing education, a paucity of research exists on how nursing students acquire skills in a traditional skills laboratory and on the transferability of psychomotor skills learned on the traditional task trainer-based single skill assessment to clinical practice (Harder, 2009; Strand, Naden, & Slettebo, 2009). Gudmundsen, in 1975, discussed the importance of three phases of performance in skill development. The first phase was designated as cognition or learning of the task. The second phase was fixation where actions are refined to minimize mistakes. The third phase was automation. The skill was believed to be thoroughly integrated in this phase and therefore, was not affected by stress or other activities. Students who were able to achieve this final phase in the skills lab were believed to be able to automatically transfer this learned skill into the clinical area (Gudmundsen, 1975).

In the early 1980s, the movement of nursing education from the hospital school of nursing to the university campus caused a shift in the focus of technical skills (Anderson, Conklin, Watson, Hirst, & Hoffman, 1985). Skills monitoring moved from the laboratory
setting to the clinical setting based on the rationale that learners could acquire technical
skills easily after learning the theory and principles behind nursing interventions
(Anderson et al., 1985). However, this trend was found not to be ideal as students could
graduate without having performed some essential skills and resulted in concerns arising
about the lack of technical skills of new graduates (Anderson et al., 1985). A few nursing
studies related to skill acquisition at this time focused on skill performance competency
practiced in the nursing laboratory versus practicing skills in the clinical areas (Gomez &
Gomez, 1987). In 1989, a paucity of research studies on the effectiveness of teaching
psychomotor skills in a laboratory setting still existed even though multiple articles over
the previous ten years had advocated the use of skill laboratories for psychomotor skill
learning and practice (Love, McAdams, Patton, Rankin, & Roberts, 1989). In one study,
Love et al. (1989) found no difference between psychomotor skill performances of
students who learned in a self-directed way as compared to students who were taught in a
skills laboratory setting.

Consequently in 1998, Knight conducted a literature review on the acquisition of
psychomotor skills in nursing and again found very little research on this subject.
Theories and articles on skill acquisition at this time supported the use of a safe,
controlled environment such as a skill laboratory for initial skill practice, but a lack of
nursing research supporting these ideas existed (Knight, 1998). A call was made for
research on the best structured, systematic approach for skill acquisition (Knight, 1998).

With the advent of technology, the 2000s brought research on technology
enhanced learning using CD-ROMs, web-based learning, videos, and the use of case-
based learning materials to augment student self-directed learning and practice despite the lack of research-based evidence on the acquisition and retention of psychomotor skills in nursing (Knight, 1998; Salyers, 2007; Snyder, Fitzloff, Fiedler, & Lambke, 2000). These methods emphasized the concept of hands-on practice prior to performing the skill in the clinical area (Salyers, 2007; Snyder et al., 2000). Salyers (2007) found no difference in skill competence between students taught skills in a traditional format with lecture, demonstration, and practice as compared to the students who used self-directed web-enhanced instruction with practice.

By the mid-2000s, high-fidelity simulation-based learning was widely established in medical education for the acquisition of psychomotor skills, repeated practice, and the ability to practice in a contextual clinical environment (Kneebone, 2005). In 2005, Rhodes and Curran explored the use of HFS to assess clinical judgment and the development of skill acquisition in nursing students. As some of the early adopters of HFS in nursing education, Rhodes and Curran (2005) developed a pilot educational project with senior nursing students using HFS for the improvement of clinical thinking and clinical judgment skills along with the inclusion of previously taught skills incorporated into a scenario. Overall, results found students felt HFS was a positive experience while faculty felt the HFS scenarios promoted critical thinking and skill practice (Rhodes & Curran, 2005).

With these improvements in technology, a shift toward the use of simulation equipment for tasks and clinical skills occurred in nursing education (Harder, 2009). Once nursing educators became more familiar with the use of simulation, research on
best practices about how to teach with simulation emerged (Harder, 2009). In addition, Harder (2010) found in her systematic review of simulation in teaching and learning in health sciences that the majority of studies found simulation increased students’ clinical skill performance.

To address the lack of literature on how nursing students acquire skill competency in a skills laboratory, Strand et al. (2009) conducted a qualitative study on how nursing students viewed learning occurred in a skills laboratory. The main finding of the study was that a feeling of security, including a safe environment with permission to make mistakes, is essential for the learning process to occur (Strand et al., 2009). Other emerging themes in this study were the importance of a supportive, interactive, team environment, learning through a sensing/kinesthetic involvement, adequate time for skill practice, and a motivated and inspiring teacher facilitating and providing feedback (Strand et al., 2009). Additionally, Hope et al. (2010), in their mixed methods study, found the learning of psychomotor and technical skills during HFS allowed students to improve their confidence in skill competency and provided a positive learning experience.

McNett (2012), in a recent literature review on teaching psychomotor skills in nursing, examined research on the most effective method to teach psychomotor nursing skills. Thirteen studies focused on psychomotor skill learning in nursing school laboratories were identified (McNett, 2012). Ten of these studies compared traditional teaching to a method of computer-based teaching, while two studies looked at the addition of simulation to the traditional method (McNett, 2012). In one of the two
studies which added simulation referenced in the review, Grady et al. (2008) examined nursing students' ability to insert nasogastric tubes and urinary catheters with low and high-fidelity manikins for skill acquisition and surveyed the students' self-reported perceptions of using HFS for these skills. The results indicated higher student skill performance with the high-fidelity manikins along with students' perceptions of HFS providing a more realistic environment for learning (Grady et al., 2007). The second comparison study found students who practiced using a standardized patient did significantly better on the performance on the basic nursing skills of back care, mouth care, position change, and catheterization (Yoo & Yoo, 2003). In addition, McNett (2012), in her review, found the most frequently taught skills in nursing education were blood pressure measurement, urinary catheter insertion, intramuscular injection, and sterile dressing changes.

In a recent literature review on simulation and psychomotor skill acquisition, Ross (2012) found a fragmented history of psychomotor skill education in nursing education. The teaching of psychomotor skills on low-fidelity task trainers was found to lack the incorporated cognitive knowledge with the psychomotor skill resulting in a disconnect between practice and actual application in the clinical environment (Nestel, Kneebone, & Kidd, 2003; Kneebone, 2005; Ross, 2012). One study concluded students who participated in skills practice with intermediate-fidelity simulation, which allowed the students to react to the patient and environment, demonstrated improved clinical skills compared to the control group which did not have the additional simulation practice (Alinier et al., 2006). Radhakrishnan, Roche, and Cunningham (2007) compared student
competency in a two patient assignment HFS scenario versus a control group who received traditional clinical training. This study found the group who practiced with HFS had significantly higher competency scores on patient identification and vital sign assessment than the control group (Radhakrishnan et al., 2007).

Additionally, Yuan et al. (2012) in a systematic review of HFS on nursing students’ confidence and competence found, in the majority of studies, students viewed HFS as a positive experience with an increase in student confidence in clinical skills. Ross, Bruderle, and Meakim (2015) examined the effect of skills laboratory training and simulation with standardized patients, as compared with a control group with only skills laboratory training, on nursing students’ competency in performing intramuscular injections. This repeated measures study obtained one pre-test and two post-test measurements from both groups (Ross et al., 2015). While these results indicated intramuscular injection competency was higher for the experimental group who received simulation training, the difference was not statistically significant (Ross et al., 2015).

Peer-to-Peer Skill Practice

The literature on the use of peer-to-peer skills practice in nursing education is sparse. However research on peer-to-peer skill practice, which can also be identified as dyad practice for motor skills training, can be found in the sports research and medical education literature. Shea, Wulf, & Whitacre (1999) found participants who practiced with a partner while completing a complex motor task demonstrated more effective and enhanced learning. The study used a dyad protocol which allowed the participants to observe each other practicing and also exchange observations with each other. Granados
and Wulf (2007) examined the effect of dyad practice, as opposed to individual practice, on enhancing motor learning and increasing the efficiency of practice. Participants in one of the interventional groups in their study were given a specific task to complete with a partner and were instructed to observe each other's practice and engaged in dialogue about the practice. The findings in the study demonstrated observed practice with a partner enhanced learning but the dialogue with the partner about practice did not. The researchers concluded observational practice provided enhanced learning by observation of the correct movement sequence, the ability to rehearse the sequence mentally while observing, and assisting the observer to avoid mistakes made by the other learner (Granados and Wulf, 2007).

Several recent medical education research articles addressed the concept of dyad practice enhancing skill learning. Räder et al. (2014) focused on the effectiveness of dyad skill practice and medical students' perceptions of the practice. The researchers found dyad practice was more efficient and cost-effective than individual practice and dyad practice promoted observational learning and individual reflection. Bjerrum, Eika, Charles, & Hilberg (2014) also found dyad practice was more efficient than individual practice with the two participants learning as much as an individual but requiring less instructor and practice time per person. No difference in the effectiveness of either individual or dyad practice was found. Both articles emphasized the importance of both individuals in the dyad practice be at the same level of skill proficiency for the experience to be effective (Bjerrum et al., 2014; Räder et al., 2014). The research by Tolsgaard et al. (2014) focused on the medical students' perceptions of dyad practice.
The study found benefits of dyad practice were self-efficacy through social interaction with peers, increased confidence, observational insight, and shared memory of steps along with feedback (Tolsgaard et al., 2014). The study recommended dyad practice during initial skills training to obtain the multiple benefits provided by the learning technique.

When teaching psychomotor skills in nursing, Oermann (2016) suggested educators should consider the use of dyad practice to help students retain skills and become more proficient. Students gain insight into the skill through alternating observation and hands-on practice of the skill. The use of dyad, or peer-to-peer practice, has the potential to improve skill performance, retention, and efficiency in learning (Oermann, 2016).

Skill Retention in Nursing Students

In their seminal article on skill decay and retention, Arthur, Bennett, Stanush, and McNelly (1998) conducted a literature review to study the factors affecting skill decay which was defined as the “loss or decay of trained or acquired skills after periods of nonuse” (p. 58). In general, skill decay increased the longer the period of nonuse (Arthur et al., 1998). Factors affecting skill decay and retention included overlearning, characteristics of the task such as closed-loop versus open-loop, physical versus cognitive tasks, natural versus artificial tasks, and speed versus accuracy (Arthur et al., 1998).

One of the factors which increased retention of a skill was the amount of overlearning (Arthur et al., 1998). Overlearning, defined as any additional training after reaching an initial level of proficiency in a skill, was believed to require more
concentrated effort leading to the development of automaticity (Arthur et al., 1998). This study recommended skill development and training programs increase the frequency and amount of practice time to maximize the amount of skill retention (Arthur et al., 1998). In addition, individual motivation and learning was a factor seen as influencing the degree of long-term retention of acquired skills (Arthur et al., 1998).

A dearth of research exists on skill retention in nursing students and on graduate nurses transitioning to practice. Research in nursing on skill retention was found to be limited to the retention of basic life support (BLS) after initial training or certification. Basic life support cognitive and performance skill retention was examined at eight weeks after initial instruction in one baccalaureate nursing program (Friesen & Stotts, 1984). One group of nursing students received the American Heart Association (AHA) traditional instructor-led class and the other group a self-paced method with AHA instruction workbooks, audiovisual cassettes, and recording manikins (Friesen & Stotts, 1984). The results showed no significant difference in retention of performance skills at eight weeks between the two groups with neither group retaining competent skill performance (Friesen & Stotts, 1984). Another study looked at BLS acquisition and retention in nursing students during a three year nursing program (Greig, Elliott, Parboteeah, & Wilks, 1996). In the initial phase of this study, the findings suggested students learning in smaller groups had better skill acquisition than those in larger groups (Greig et al., 1996). Madden (2006) investigated the acquisition and retention of BLS cognitive knowledge and psychomotor skills in nursing students. A BLS pre-test, AHA training, and post-test were all conducted on the same day with participants then re-
administered ten weeks later. A significant reduction in the performance and retention of BLS psychomotor skills was found in the ten week post-test results (Madden, 2006).

Overall, research on BLS skill retention in nursing students has demonstrated a lack of retention of competent skill performance over time without opportunities to practice (Ackermann, 2009; Kardong-Edgren & Adamson, 2009; Montgomery, Kardong-Edgren, Oermann, & Odom-Maryon, 2012; Oermann, Kardong-Edgren, & Odom-Maryon, 2011). One study demonstrated BLS skill practice comprised of only six minutes of monthly practice with feedback resulted in improved skill performance and student confidence (Oermann, Kardong-Edgren, & Odom-Maryon, 2011). Therefore, the literature on BLS skill retention supports the need for practice with feedback to improve and maintain skill competency. This documented need for practice to retain skill competency in BLS may be transferable to other basic skills taught in nursing school as repetition may be the key to skill retention (Leighton & Scholl, 2009).

Skill Integration into HFS

Medical education studies have shown combining HFS and skill acquisition resulted in faster skill acquisition and enhanced skill performance (Barsuk, Cohen, et al., 2009; Butter et al., 2010; Duvivier et al., 2011; Garrett et al., 2010; McGaghie et al., 2011; Wayne et al., 2006). Following this trend, several nursing schools have incorporated HFS into their undergraduate programs as an additional learning tool and as a way to measure clinical competence (Nehring, 2010b). The majority of studies focused on simulation use and clinical skill performance have shown that the combination of HFS and skills integration improved the students’ performance (Alinier et al., 2006; Harder,
The use of HFS during OSCEs to provide a more realistic, interactive environment for skills learning has also been shown to improve skill task performance and retention (Alinier et al., 2006). The interactive characteristics of high-fidelity simulation can enhance learning and skill competency by providing an environment where the student can respond to the patient, perform the skill, and receive meaningful feedback (Grady et al., 2008; Hope et al., 2010). The additional skill practice during HFS allows the student to remember and refine their actions which results in increased motor learning memory (Kardong-Edgren & Adamson, 2009). In this way, HFS can enhance skill acquisition and retention and promote transference of learned skills into safe clinical practice (Grady et al., 2008).

Incorporating skill practice into HFS scenarios provides a bridge between traditional skills check offs and performing skills on actual patients (Ackermann, 2009). One study, focused on basic cardiopulmonary resuscitation (CPR) skills in nursing students, demonstrated students who had additional CPR practice in HFS scenarios demonstrated higher acquisition and retention than students who did not receive the HFS learning experiences (Ackermann, 2009). Another study suggested students gained knowledge and skill proficiency through the use of OSCE and HFS which provided skills practice, testing, and feedback (Moule et al, 2008).

Deliberate Practice in Nursing Education

Because research has documented the importance of deliberate practice in skill acquisition and retention in medical students, Ericsson et al. (2007) called for research
into the study of expert-performance in nursing students to assess skill acquisition and retention by developing standardized, representative tasks of nursing. Additional skill practice and assessment during HFS scenarios would enhance skill competency by providing feedback on performance and converting this feedback into “goals for deliberate practice and training tasks in which individuals can engage outside the simulator” (Ericsson et al., 2007, E69). Since this time, a few studies in nursing education have utilized Ericsson’s deliberate practice framework. Hauber, Cormier, & Whyte (2010) investigated the relationship between knowledge and performance in HFS scenarios within the context of the expert-performance approach. Cognitive and performance-related variables were measured to assess participant performance during a HFS clinical scenario. Hauber et al. (2010) noted students who completed skill performance tasks well in a static environment did not necessarily perform the skill correctly during a scenario requiring multiple decisions and prioritization of care. The authors suggested the variations in student performance could have been related to individual differences in deliberate practice of the skills prior to the study (Hauber et al., 2010).

In 2010, Garrett et al. conducted a pilot evaluation study on the integration of HFS and effective learning based on the use of scenarios including psychomotor skills and similar complexity levels. These researchers concluded the use of HFS provides a safe environment for students to improve clinical competence through deliberative, repeated practice with feedback (Garrett et al., 2010). In 2011, Oermann et al. examined the use of deliberate practice for developing expertise and retention in BLS psychomotor
skills. In a large randomized controlled trial of 606 nursing students in ten schools of nursing, students were assigned to either an intervention (monthly practice with AHA voice-advisory manikin) or a control group (no practice) (Oermann, Kardong-Edgren, & Odom-Maryon, 2011). Twenty percent of the students were randomly assessed for BLS performance retention every 3 months for one year, with the reassessed students in both groups dropped from the study to maintain rigor. Students in the intervention group, which participated in monthly deliberate practice of skills, had significantly better performance than the control group who had no practice beyond the initial training (Oermann, Kardong-Edgren, & Odom-Maryon, 2011). The researchers recommended the use of deliberate practice for skills and the integration of high-use skills into HFS scenarios to promote competency and retention (Oermann, Kardong-Edgren, & Odom-Maryon, 2011).

In a study on the inclusion of a cardiovascular assessment curriculum for advanced practice nurses with objective structured clinical examinations (OSCEs) for measuring assessment techniques, students demonstrated increased cardiovascular assessment skills after independent, deliberate, hands-on practice with the cardiology simulator (Jeffries et al., 2011). Jeffries et al (2011) concluded the use of deliberate practice and a simulation-based curriculum allowed the students to acquire clinical skills in a self-paced learning environment with positive high learner self-efficacy and satisfaction scores. Liou et al. (2013) examined the effects of deliberate practice of nursing skills and skills testing on RN to BSN nursing students’ perceptions of clinical competence prior to and after their clinical practicum experiences. In this study, essential
nursing skills were identified with training equipment and instructional videos provided for practice (Liou et al., 2013). In addition, instructors were available for assistance if needed during the scheduled practice times. The post test scores on the clinical competence questionnaire increased significantly from the pre-tests scores in general performance, nursing professional behaviors, core nursing skills, and advanced nursing skill (Liou et al., 2013).

Whyte and Cormier (2014) investigated the use of a deliberate practice intervention on improving clinical performance in senior nursing students in a HFS scenario. The participants were divided into two groups with the control group completing pre and post-test sessions only, while the participants in the intervention group completed two deliberate practice-based training sessions in between the pre and post-tests scenarios (Whyte & Cormier, 2014). The participants in the intervention group demonstrated a clear improvement in the ability to detect a change in condition and take action (Whyte & Cormier, 2014). This study applied the concept of deliberate practice to assess and analyze clinical decision making skills, instead of task-based nursing skills, to improve performance and prepare students to provide safe, quality nursing care (Whyte & Cormier, 2014).

Gaps in Literature

The literature review revealed substantial gaps remain in the nursing literature regarding best evidence-based practice for skill acquisition and retention and the combination of deliberate practice and HFS for skill acquisition and retention. Since deliberate practice combined with HFS has been designated as best practices in medical
education, the time is now for nursing education to apply Ericsson's expert-performance model to improve skill competency acquisition and retention in nursing students (Clapper & Kardong-Edgren, 2012; Issenberg et al., 2005; McGaghie et al., 2010). This framework promotes the practice of skills beyond initial skill acquisition to promote competency and retention in specific nursing tasks (Chee, 2014; Oermann, Mallory, & Vaughn, 2014). Additionally, skill practice should be spaced throughout the curriculum to further promote retention of learned psychomotor skills (Oermann et al., 2015).

Inferences for Current Study

A few studies in nursing have demonstrated consistent findings related to the positive effects of deliberate practice on skill acquisition and retention (Garrett et al., 2010; Hauber et al., 2010; Jeffries et al., 2011; Liou et al., 2013; Oermann et al., 2011). Ross et al. (2015) incorporated deliberate practice with peer mentoring into a four year baccalaureate nursing program as a best practice, evidence-based teaching format. Comments from faculty, students, and peers provided positive feedback for the acquisition and mastery of skills through this innovative teaching strategy (Ross et al., 2015).

Nurses are essential to patient safety and quality care; therefore, nursing curricula must include a focus on quality and safety (AHRQ, 2008). The development of innovative, learner-based quality educational teaching strategies will provide the knowledge, skills, and attitudes to provide safe, quality patient care. High-fidelity simulation combined with deliberate practice will allow students to practice and then apply knowledge and theory learned in the clinical setting. Immediate feedback and the
ability to repeat situational scenarios will assist in consolidating learning and the development of skill competence.

Clinical skills proficiency underpins all nursing practice and the acquisition of clinical skills, informed by relevant theoretical knowledge, represents a crucial element in the process of learning to be a competent nurse (Bloomfield et al., 2010). The addition of the concept of deliberate practice brings another active learning strategy to nursing education to improve knowledge and skill competency. The combination of deliberate practice and HFS allows a natural progression in skill acquisition by incorporating the complexities of performing a skill on an actual patient (Nestel et al., 2003; Ross, 2012). Research is needed about how to best incorporate deliberate practice into HFS for skill acquisition and retention in nursing education.

Summary

This chapter provided a synthesis of the literature on expert performance and acquisition in multiple fields, the concept of deliberate practice in medical and nursing education, and skill acquisition and retention in nursing education. A brief review of the literature on peer-to-peer practice of skills was also delineated with inferences for the current study discussed. The review of the literature of skill acquisition research in medical students with characteristics of deliberate practice, such as opportunities for repetitive practice with focused feedback, revealed an increase skill performance (Ericsson, 2007). Ericsson’s framework on deliberate practice and expert performance was used to guide the researcher’s study on the use of deliberate practice and HFS in promoting skill competency and retention in pre-licensure nursing students. The pilot
study provided an initial response to answer the call for transformation in nursing education and provide new graduates the ability to enter the workforce better prepared to provide safe, quality care. In conclusion, the use of deliberate practice combined with HFS in nursing education based on Ericsson's expert-performance model of deliberate practice can provide the opportunity for adequate acquisition, assessment, and retention of skill competence (Cannon-Diehl, 2009; Ericsson, 2007; Ericsson et al., 2007).
CHAPTER 3

METHODOLOGY

The purpose of this chapter is to describe and provide rationale for the pilot mixed methods research study design. Additionally, this chapter provides an overview of the setting, sample, randomization procedures, and protection of human subjects who participated in this study. Recruitment, instrumentation, data collection, implementation of the experimental protocol, and data analysis procedures are also delineated.

Research Design

The pilot study used a convergent parallel mixed methods design. This methodology was chosen to address the research questions posited based on the limited studies in nursing education focused on the combination of deliberate practice with high-fidelity simulation (HFS) for skill acquisition and retention. The design provided a method to collect complimentary quantitative and qualitative data. Figure 1 represents a diagrammatic outline of the convergent parallel mixed methods procedural sequence (Creswell & Plano Clark, 2011).
Figure 1. Study Flow Chart of the Convergent Mixed Method Design Used for Current Study.

The study was conceptualized as a pilot study. Pilot studies are conducted to assess the feasibility of a larger intervention study and to increase the likelihood of success in a larger, multi-centered study (Thabane et al., 2010). In addition, pilot studies fulfil a range of important functions including information related to the instruments, logistics, and costs which can provide valuable insights for other researchers (Hertzog,
Lessons learned from pilot studies can provide valid evidence on the possible effects and associations of methods and interventions and identify if more rigorous research is indicated (Polit & Beck, 2012; Thabane et al., 2010). Therefore, pilot studies perform an important role in directing research which advances the knowledge in nursing education pedagogies (Ferguson, Myrick, & Yonge, 2006; Polit & Beck, 2012). This pilot study yielded insight into how all aspects of the mixed methods design were implemented and provided preliminary evidence for the impact of deliberate practice on urinary catheter insertion.

### Mixed Method Research

Creswell (2014) described mixed methods research as an approach consisting of incorporating elements of both qualitative and quantitative research. The aim of using the mixed method methodology in the current study was to provide a better understanding of the research problems by collaborating and combining results (Creswell & Plano Clark, 2011). The combining of quantitative and qualitative research approaches allowed the strengths of each type of data to offset the weaknesses of each method (Creswell & Plano Clark, 2011). Therefore, the use of this mixed method design in this research provided a more complete understanding of the problem being explored.

The mixed method research design used in this study combined a complementary quantitative and qualitative strand (Polit & Beck, 2012). In the quantitative strand, the researcher collected words and numbers in a demographic and a data collection form. Then in the qualitative strand, the researcher strove to capture the essence of the values, beliefs, and assumptions of the participants. By bringing the numbers and personal
experiences together, the mixed methods design allowed the researcher to approach the research questions pragmatically from multiple angles and fully understand the research problem (Creswell, 2014; Polit & Beck, 2012). In addition, the mixed method approach enhanced validity of the results through the acquisition of more than one type of data (Polit & Beck, 2012).

Quantitative Philosophy

The mixed method methodology also provided the incorporation of certain philosophical assumptions along with the chosen methods of inquiry (Creswell, 2014). Creswell (2014) believed the pre-conceived philosophical worldview assumptions a researcher brings to a study should correlate with the research design (Creswell, 2014). Therefore, the quantitative strand of the research method reflected the researcher’s traditional post-positivism philosophy by examining measurable variables and observations (Creswell & Plano Clark, 2011). These post-positivist assumptions represent the traditional view of research in which causes determine effects or outcomes (Creswell, 2014). Research based on these beliefs include use of a randomized controlled design for the quantitative data collection based on measurement instruments and examination of the standards of validity and reliability in the methods and conclusions. The quantitative data collected for this research correlated well with this traditional research view.

Qualitative Philosophy

The philosophical paradigm guiding the qualitative inquiry was constructivism. In constructivism, a worldview or philosophy underlies the inquiry to provide a better
understanding of the world with the goal of the research focused on the participants’ view of the experience being studied (Creswell, 2014; Creswell & Plano Clark, 2011). This philosophy underpinned the qualitative strand and affected all choices and assumptions. In addition, this philosophy guided the qualitative inquiry when looking at the multiple perspectives formed by the participants as the researcher looked at the complexity of the situation being studied (Creswell, 2014). The different beliefs, values, and assumptions of the participants were discovered through interviews and used to build broader themes and generate interconnecting theories to explain the results (Creswell & Plano Clark, 2011).

Mixed Method Data Analysis Philosophy

The philosophical paradigm for this approach was pragmatism. This worldview highlights the merging of the quantitative and qualitative strands by looking at the overall results of the study to the research problem (Creswell & Plano Clark, 2011). In this mixed method design, the goal was to “obtain different but complementary data on the same topic” (Creswell & Plano Clark, 2011, p. 77). The results of the quantitative and qualitative strands were self-contained until merged and were not dependent on each other.

The qualitative data were collected using a phenomenological approach to explore the lived experiences of the participants enrolled in the different interventional groups of the study. The semi-structured qualitative interviews assisted the researcher in providing a richer and deeper understanding of the phenomenon being studied (Streubert &
Carpenter, 2011). The data analysis approach for the qualitative inquiry strand of this research was based on descriptive phenomenology.

The use of descriptive phenomenology is based on the “use of language to articulate the intentional objects of experience” (Giorgi, 2012, p. 6). Giorgi (1985) discussed the importance of understanding a phenomenon through obtaining descriptions of the lived experience. During the description, the participant is able to reflect on the experience in order to detect a meaning and then the meaning can be described also (Giorgi, 2012). In researching the phenomenon of learning, the goal is to obtain concrete descriptions of how learning occurred (Giorgi, 1985). The description is essential to determine concretely what actually happened from the participant’s, not the researcher’s, perspective of the experience (Giorgi, 1985). Moreover, Giorgi (2012) stated the phenomenological method can be applied to a specific pedagogy by assuming the attitude of that discipline.

The identification of the point of integration of data in this mixed method research occurred after separate analysis of each strand (Creswell, 2014). The findings were merged by comparing the quantitative statistical results to the qualitative interview findings. Consequently, the mixed method approach allowed the researcher to develop a more complete understanding of the phenomenon (Creswell & Plano Clark, 2011).

Setting

The setting for this study was a pre-licensure baccalaureate degree nursing program in a small college set in a southern rural community. The college simulation laboratory was located on the second floor of the building in which the division of
nursing resided and was easily accessible to all potential study participants. The room used for the study contained one high-fidelity patient simulator and other equipment designed to resemble a patient hospital room and hospital supplies. The simulation room and the debriefing room were both located behind double doors for privacy and confidentiality. The debriefing area contained tables and comfortable chairs.

**Sample**

A non-probability, convenience sample of pre-licensure baccalaureate nursing students enrolled in an adult health medical-surgical nursing course participated in the study. The inclusion criteria for the study were the participants had to have completed all pre-requisites for the course and had to have been in the first semester of their senior year in the nursing program. In addition, the participants had to have the ability to speak, read, and write English, and be greater than 18 years of age. The inclusion criteria were selected to ensure urinary catheter insertion instruction had been completed in the junior year using the same approach for all students prior to the same students entering the senior year.

**Instrumentation**

Instrumentation for the quantitative data collection included a demographic form, a urinary catheter insertion competency measurement checklist for the pre-test, the post-test skill competency assessments, and the post-test skill retention assessment. The qualitative data were obtained with face-to-face semi-structured interviews. Each instrument used for data collection is described in detail in this section and copies of the instruments are in the appendices.
Demographic Data

The demographic form (See Appendix A) included items to measure age, gender, ethnicity, and whether the participant was obtaining a traditional first baccalaureate degree or a second baccalaureate degree. The demographic form also addressed whether the participants were currently working or had experience working as a nurse technician or assistant. This form provided data regarding the demographic characteristics of the accessible population so generalizability of the findings to other populations could be possible (Polit & Beck, 2012).

The demographic form also contained three Likert scale items. These items focused on the student's perception of confidence in his or her ability to perform nursing skills, the importance of nursing skills in becoming a competent nurse, and how important practice is to learning and being able to perform a nursing skill. The Likert scale contained five response alternatives ranging from 5 “very confident” or “very important” to 1 “not confident at all” or “not important at all” (see Appendix A).

Urinary Catheter Insertion Competency and Retention Assessments

An 18-item urinary catheter competency measurement assessment checklist was used for the competency assessment and retention measurement (see Appendix B). The 18-item urinary catheter competency measurement assessment checklist was developed by the researcher based on the 2009 Centers for Disease Control and Prevention (CDC) healthcare infection control practices advisory committee (HICPAC) guidelines, Association for Professionals in Infection Control and Epidemiology (APIC) (2014) guidelines, and instructions from the BARD® advance Foley tray system. Each step in
the checklist was listed in correct procedural order and given equal weight. A 0 to 2 point scoring scale was used with “2” indicating the step was completed correctly and in the correct order, “1” indicating the step was completed but not in the correct order, and “0” indicating the step was not completed or omitted. The highest total possible score on the checklist was 36 based on all items performed correctly and in the correct order. The checklist was reviewed for completeness and accuracy by four other nursing education faculty with expertise in urinary catheter insertion competency. This review assisted in establishing face validity of the checklist.

In addition, content validity of each individual step and of the checklist as a whole, measuring all dimensions of the construct of urinary catheter insertion competency measurement were examined. Content validity was assessed by five experts in competency assessment in either the field of nursing education or hospital nursing education. The calculation of a content validity index (CVI) was completed on the relevancy and appropriateness of each individual item to determine if the checklist as a whole adequately measured all dimensions of the construct of urinary catheter insertion (Polit & Beck, 2012). A four-point Likert scale was used to measure the relevance of each item with 1 “not relevant,” 2 “somewhat relevant,” 3 “quite relevant,” and 4 “highly relevant.” The item CVI (I-CVI) was computed based on the ratings for each item and divided by 5 (the number of experts). A scale CVI value of 0.94 was obtained by averaging the I-CVIs. A value of 0.90 or greater indicates excellent content validity (Polit & Beck, 2012). Consequently, the checklist was deemed to have strong evidence for content validity.
Psychometric evaluation of the urinary catheter competency measurement checklist by the researcher and a second rater was completed during the study to minimize biases and maximize accuracy in using the instrument (Polit & Beck, 2012). To assess interrater reliability during the study, a random sample of at least 25% (7) of the pre-tests assessments were videotaped and rescoring by a second examiner. The second examiner was blinded to the results of the first examiner and to which study group participants were assigned. The second examiner was a nurse educator with experience in urinary catheter insertion competency assessments. Any discrepancies between the second examiner and the researcher were discussed and resolved by reviewing the videotaped assessment together. Rater training included comparability of what both observers coded while watching the video recorded assessments. Prior to the remaining two post-test assessments, this rater training was reviewed to maintain accuracy in using the instrument.

On the first day of using the urinary catheter competency measurement checklist to measure the participants’ performance, the researcher and second rater met briefly after each had checked off one participant to discuss a flaw noted in the checklist. The checklist did not have a column to mark for a step performed incorrectly. The researcher and second rater decided to go forward and mark any step performed incorrectly with the letter “I.” They also met again after all the pre-test competency assessments were completed to review several video recorded assessments to evaluate consistency of the ratings and to discuss the need for a possible change in the competency measurement checklist. Originally, the checklist consisted of three ratings for each step. The first
rating column was labeled “Completed” and was checked if the step was completed correctly and in the correct order. The second rating column was labeled “Completed but not in Correct Order.” This column was checked if the step was completed and followed the recommended order on the checklist. The final rating column was labeled “Not Completed/Omitted” and was marked when a step was not completed or omitted. Based on these categories, the need for a column to mark any step performed incorrectly was identified.

Consequently, the researcher met with her dissertation chair to discuss the possibility of adding “Not Performed Correctly” to the checklist. After discussion, the last column on the competency measurement checklist was changed to include “Not Performed Correctly” in addition to “Not Completed/Omitted.” The final scoring scale for all assessments was 2 “Completed,” 1 “Completed but not in Correct Order,” and 0 “Not Completed/Omitted/Not Performed Correctly.” The possible range of scores on the assessment remained 0 to 36 with higher scores indicating greater competency. To protect the validity and integrity of the measurement, all checklists from the first pre-tests assessments were rescored with incorrectly completed steps which were previously marked with the letter “I” rescored as a “0.”

To increase consistency of the ratings, the researcher completed the majority of the competency measurement assessment checkoffs when possible. For the first pre-test competency measurement assessment, of the 28 assessments completed, the researcher completed 71% (20) and the second examiner completed 29% (8). For the second competency measurement assessment check off, of the 28 assessments completed, the
researcher completed 54% (15) and the second examiner 46% (13). For the third competency measurement assessment check off, of the 28 assessments completed, the researcher completed 79% (22) and the second examiner 21% (6).

Qualitative Interviews

The qualitative data collection procedure was based on Giorgi’s (2009) descriptive phenomenological method of interviewing. In the semi-structured, traditional, face-to-face interview, the interviewer asked questions that led the participant to provide a complete as possible detailed description of the experience or phenomenon (Giorgi, 2009). The interviewer’s focused interest was on the meaning of the phenomenon with the situation providing a contextual meaning (Giorgi, 2009). The face-to-face interviews were conducted to provide rich, vivid descriptions with subtle depth and nuances of the experience (Englander, 2012; Giorgi, 2005, 2009).

Questions in the interview were focused on the description of the situation in which the participant experienced the deliberate practice. The first question asked involved asking the participant to describe in detail the phenomenon experienced (Giorgi, 2009). The following question was on the “lived effect” of this phenomenon on the participant (Englander, 2012). The following prompts were used to guide the interviews: (1) Please describe in detail the peer-to-peer deliberate practice had on your ability to perform urinary catheter insertion competently. (2) With the experience in mind, describe the effect deliberate practice during simulation had on your ability to learn urinary catheter insertion? Prompts included: Tell me more about . . .; please describe in
more detail if the experience has affected your learning experience? (See Appendix C for the full interview guide).

Recruitment, Randomization Procedures, and Data Collection

Recruitment first occurred during the initial quantitative strand of the study. Recruitment for the qualitative data collection began after all competency assessments were completed. The following section describes the procedures for recruitment, randomization, and data collection in more detail.

Recruitment

At the beginning of the fall semester, volunteers were recruited for the study during the first week of the senior level adult medical surgical nursing class. A faculty member, other than the researcher, served as an intermediary during the recruitment and research process to reduce the effects of faculty power and coercion which potentially could have been perceived by the students and to provide ethical recruitment (Ferguson et al., 2006). The faculty intermediary did not have any direct teaching or grading responsibilities for students but was a familiar and trusted former professor. The faculty intermediary provided students with information about the opportunity to participate in the study and students were allowed to ask questions about the study. The faculty intermediary emphasized participation in the study was voluntary and would not affect the students' grades. Students were informed study participation would be during current planned course time and no students would be required to attend any extra hours to participate in the study. In addition, the faculty intermediary explained the consent was to use his or her urinary catheter insertion skill assessment data and all students,
regardless of consent status, would be randomly assigned to different HFS groups as part of the current course. All participants were given the researcher’s and dissertation chair’s contact number and email for any questions or concerns related to the study. The faculty intermediary also informed the students in the course that all would be thanked (regardless of consent status) with a $10 gift card at end of spring semester.

All students in the course, regardless of participation in the study, were asked to sign a confidentiality form related to all HFS experiences. In this form, the students agreed to not discuss details of the simulation days with anyone outside his/her group (see Appendix D) and agreed to the use of audiovisual digital recording during HFS. Additionally, the demographic data (see Appendix A) were obtained at the time of informed consent by the faculty intermediary.

During the study implementation and throughout data collection, the researcher was blinded to the fact that all students had consented to participate. Additionally, the faculty intermediary kept the signed consents and a list of all students who consented to have their data used in a locked file cabinet in her office where the researcher did not have access. All students remained blinded to the intervention groups for the duration of the study to prevent biases from awareness and expectations (Polit & Beck, 2012).

For the qualitative data collection, a purposive sample of five participants from the deliberate practice intervention group were asked by the faculty intermediary to participate in a qualitative interview with the researcher. All students were approached by the faculty intermediary, with the researcher blinded to the students approached, to assess each participant’s willingness to be interviewed. The use of a faculty intermediary
helped minimize any perceived pressure on students to participate in the interviews. The faculty intermediary informed the students the researcher would not know if they declined to participate in the interview process. All interviews were audio-recorded and semi-structured. An interview guide used to assist in conducting the interviews (see Appendix C).

Randomization Procedures

After consents were obtained, the faculty intermediary assigned a unique identification number to all students in the course. Following the recommended sequence of steps for a randomized design, randomization occurred after the pre-test (baseline data) competency assessments were completed (Polit & Beck, 2012). Because all students in the course consented to participate in the study, the faculty intermediary randomized all students into six groups (two groups for each of the intervention groups). The faculty intermediary conducted the randomization of the participants by their assigned unique identifiers into the six groups using the website randomizer.org.

Data Collection

Quantitative. For the quantitative phase, a pre-test, intervention, post-test design was implemented as recommended by Creswell and Plano Clark (2011). Quantitative data collection consisted of a demographic form (see Appendix A), a baseline competency assessment (or pre-test) for all students on urinary catheter insertion, a post-test 14 weeks after the initial assessment, and a post-test seven weeks after the first post-test to measure skill retention. A urinary catheter insertion competency measurement form (see Appendix B) was used to assess the students' abilities to perform the urinary
catheter insertion skill. The urinary catheter insertion competency measurement checklist focused on key critical items related to the maintenance of sterile technique during the procedure. The same urinary catheter insertion kits were used by all study group participants in each separate competency assessment. However, due to unforeseen circumstances with the manufacturer, similar, not identical kits, were used for the second and third skill competency assessments. The first competency assessments were completed with BARD® urinary catheter insertion kits. However, the second and third competency assessments were completed using similar urinary catheter kits from Pocket Nurse®. Also, the same female adult manikins were used for all three competency assessments for consistency.

Qualitative. The interviews were conducted during planned classroom activity time and interviewees were not required to spend any extra hours participating in this strand. To reduce the potential of students to be predisposed to provide answers they perceived the researcher would want to hear, several steps were taken: (1) the interviewee was aware the interview was about the study but not informed prior to the interview of the specific topics to be discussed, (2) the researcher did not indicate which teaching method was the focus of the research during the interview time, and (3) the interviewee was encouraged to answer honestly and openly without fear of any repercussions.

The qualitative interviews were originally planned to take place in the debriefing area to provide a familiar, comfortable, non-stressful environment. However, due to the inability to obtain sufficient privacy during the participant’s available time for interviews, this area was not used. Consequently, the interviews took place in the researcher’s office.
To alleviate participant stress and encourage a friendlier atmosphere, the researcher and participants sat side by side together in a non-formal arrangement. This environment was used to encourage the participants to share important information and to facilitate qualitative data collection (Streubert & Carpenter, 2011).

Implementation of Experimental Protocol

The implementation of the experimental protocol began with the scheduling of the first competency assessment. The first competency assessment was announced in class at the beginning of the semester the day before the assessment occurred and the students were not told what skill would be assessed. For each competency assessment, students were randomly assigned times to come to the simulation laboratory to complete the assessment. The students were blinded to the skill being assessed until the time of assessment for all competency measurements. In order to maintain accurate data collection and rigor, the students remained blinded to the intervention and skill focus during the entire study to prevent students from practicing urinary catheter insertion. To ensure the same competency assessment experience for all participants, students were instructed not to discuss details about their assessment with other students.

To maintain student privacy and confidentiality of the data, after each competency assessment was completed, the student was given his/her own rater completed urinary insertion competency measurement sheet to turn into the faculty intermediary. The faculty intermediary replaced the student names on the sheet with the student’s unique identifying number prior to returning to the researcher. This process was followed after each competency assessment. The researcher did not have access to the list of students
and unique identifiers to maintain anonymity of the participants and ensure that the data could not be attributed to a specific participant. The faculty intermediary kept the list of students and associated unique identifiers in a password protected document on a password protected computer in her private office.

During the next 14 weeks of the fall semester, the three intervention groups spent four five-hour sessions on separate days throughout the semester in the college nursing simulation laboratory and participated in eight HFS scenarios. The three groups were designated as follows:

1. Group A. This group represented the control group in the study and the group did not participate in deliberate practice of urinary catheter insertion and the insertion of a urinary catheter was not integrated into the HFS scenarios. Also, no additional skill review or practice occurred in this group. This group represented the control group or traditional HFS scenarios which do not contain nursing skills.

2. Group B. In this group, a different nursing skill was reviewed prior to each session and the review was followed by peer-to-peer practice for 15-20 minutes prior to each HFS session. The skills reviewed and practiced in this group were: blood pressure measurement, nasogastric tube insertion, wound care, and peripheral intravenous catheter insertion. This group participated in HFS scenarios using full scale computerized patient simulators which provided a high level of interactivity and realism for the learner. In this group, the urinary catheter insertion skill was integrated
into all the HFS scenarios but no deliberate practice of urinary catheter insertion occurred.

3. Group C. In this group, urinary catheter insertion was practiced for 15-20 minutes during peer-to-peer deliberate practice prior to each HFS session. This group participated in HFS scenarios using full scale computerized patient simulators which provided a high level of interactivity and realism for the learner and the urinary catheter insertion skill was integrated into all the HFS scenarios. This group was considered the intervention group and participated in peer-to-peer deliberate practice of the urinary catheter insertion skill prior to every HFS session.

*Figure 2* summarizes the study sequence for all three groups in the study.
Figure 2. Study Sequence and the Three Groups.

All participants complete pre-test competency check off

All participants randomized into 3 groups

Group A - HFS Only

Four five-hour sessions in Simulation Laboratory
Each session contains:
• 2 HFS scenarios, no urinary catheter insertion
• Debriefing after each scenario

Group B - HFS & Skills

Four five-hour sessions in Simulation Laboratory
Each session contains:
• Deliberate practice of a new skill each week
• 2 HFS scenarios where the patient requires insertion of a urinary catheter
• Debriefing after each scenario

Group C - DP & HFS with Skill

Four five-hour sessions in Simulation Laboratory
Each session contains:
• 20 minutes of deliberate practice of urinary catheter insertion
• 2 HFS scenarios where the patient requires insertion of a urinary catheter
• Debriefing after each scenario

All participants complete post-test competency assessment checkoff at end of fall semester

All participants complete post-test competency retention assessment at beginning of spring semester

Quantitative Data Analysis begins

Qualitative Data Collection

Selection of 5 participants in deliberate practice group for interview for qualitative strand

After first cycle coding, selection of 2 participants from Group B for interview

Qualitative Data Analysis

Merging of Quantitative and Qualitative Data
Protocol for Peer-to-Peer Practice

In order to efficiently implement skill practice in Group B (HFS with Skills) and Group C (DP with HFS), peer-to-peer practice was used. However, the type of skills and whether the skill was demonstrated by faculty differed between the groups. Also, the control group, Group A, did not participate in any peer-to-peer skill practice.

The following guideline was followed in providing the participants in Group B with skill review and practice prior to each HFS session. First, the researcher reviewed and demonstrated a skill previously learned in the junior year with the group as a whole. Then the students were divided into groups of two. Each group of two spent 15 minutes in peer-to-peer practice. The students were instructed to give each other feedback on performance and recognize areas for improvement. These practice sessions were informal and the researcher was available for feedback and to answer any questions during this time. A different skill was practiced prior to each session based on student input. However, urinary catheter insertion skill practice was not provided.

The following guideline was followed in providing the participants in Group C urinary catheter insertion practice prior to each HFS session. The students were divided into groups of two. Each group of two spent 15-20 minutes in peer-to-peer deliberate practice. The students were instructed to give each other feedback on performance and recognize areas for improvement. The researcher observed the overall practice session and was available for any questions and to provide feedback during this time.
Protocol for HFS Scenarios and Data Collection

The following guideline was used for each HFS scenario. Each HFS scenario began with a pre-brief session with students receiving report on the patient. Students were given five minutes to meet and determine roles, nursing priorities, and interventions. Each HFS scenario lasted approximately one hour and was immediately followed by a researcher-led debriefing session. All HFS scenarios used were preprogrammed to ensure comparable HFS experiences for all participants. The preprogramming allowed the scenario to run the same way for every student group and provided consistency and standardization of the simulation experiences for this research study.

After 14 weeks, all participants completed a second competency measurement assessment (first post-test skill competency assessment) with the researcher or the second rater using the urinary catheter competency measurement checklist. Steps, which were previously delineated, to ensure student privacy and confidentiality were rigorously maintained each time. The next measurement of competency of the participants was seven weeks later during the early part of the spring 2016 semester. The third (second post-test) assessment measured the level of retention of the urinary catheter insertion skill among participants. At the end of the spring seven week semester, each student in the course (regardless of consent status) was thanked with a $10 gift card.

Overview of Data Analysis

The quantitative data analysis was completed through rigorous data analytic procedures as recommended by Creswell & Plano Clark (2011). These procedures
included: (1) preparing the data for analysis, (2) exploring the data, (3) analyzing the data, (4) representing the data analysis, (5) interpreting the data, and (6) validating the data. An analysis of the quantitative data was begun by entering all data into a Statistical Package for the Social Sciences (SPSS) database. Preparing and exploring the quantitative data were conducted through descriptive statistics after the following steps: coding, preparing the data file, entering the data, screening and cleaning the data, and running analysis through SPSS 22 software (Creswell & Plano Clark, 2011; Pallant, 2010). No missing data or errors were found.

Categorical (demographic) data were displayed using frequencies and percentages. Descriptive statistics were obtained on continuous variables and included mean, standard deviation, range of scores, skewness, and kurtosis. Assessment of normality using Kolmogorov-Smirnov tests were completed to assess the distribution of scores. Analyzing the data included the use of inferential statistics by the researcher to form conclusions based on the sample population and to infer how the findings could be further applied in nursing education (Creswell & Plano Clark, 2011; Polit & Beck, 2012).

A one-way analysis of variance (ANOVA) was conducted to test the difference between the means on skills competency and retention between the three groups. General assumptions for parametric techniques were met by: (1) the dependent variable (competency measurement) at the interval/ratio level, (2) independence of observations, (3) normal distribution of the dependent variable, and (4) homogeneity of variance (Pallant, 2010).
The qualitative data were entered and displayed in an Excel spreadsheet to facilitate analysis. A hard copy of the spreadsheet was used to facilitate coding and identification of themes and subthemes. Identified themes were then entered into an additional Excel spreadsheet to facilitate mixed method analysis.

Data analysis occurred at three distinct points. Analysis occurred with each independent set of data (quantitative and qualitative) and then during the combined analysis of the data sets. Each research question was addressed with data results and results were compared with any prior literature (Creswell & Plano Clark, 2011). In the final step, external and internal validity of the data and results were checked (Creswell & Plano Clark, 2011). The following specifies the data analysis for each research question.

Data Analysis Plan per Research Question

Research Question 1 (RQ1). *Do pre-licensure baccalaureate nursing students in the deliberate practice combined with HFS group demonstrate greater skill competency in urinary catheter insertion than students in the traditional HFS scenario group, and HFS skill integration group?* For RQ1, the data from the pre-test assessments and the first post-test assessments were analyzed using a one-way ANOVA to test the overall differences between the means in the three groups. Post hoc tests were not required as none of the F statistics for the ANOVA models were statistically significant (Polit & Beck, 2012). An eta squared effect size was calculated to determine the magnitude of the differences between the groups.

Research Question 2 (RQ2): *Do pre-licensure baccalaureate nursing students in the deliberate practice combined with HFS group demonstrate greater skill retention in*
urinary catheter insertion than students in the traditional HFS scenario group, and HFS skill integration group? For RQ2, the data from the second post-test assessment of urinary catheter insertion competency were analyzed using one-way ANOVA to test the overall differences between the means in the three groups. Post hoc tests were not required as none of the $F$ statistics for the ANOVA models were statistically significant (Polit & Beck, 2012). An eta squared effect size was calculated to determine the magnitude of the differences between the groups.

Research Question 3 (RQ3): What are the pre-licensure nursing students’ perceptions of the effectiveness of deliberate practice on urinary catheter insertion skill competency and retention? To address this question, the interview data from the five participants selected from the group participating in deliberation practice was transcribed. The transcriptions were read and coded, and themes were identified using first and second cycle coding as delineated by Saldaña (2013) to analyze the data. In qualitative research, the data collection and data analysis should follow the same philosophical underpinning to be part of a single, unified process in order to achieve the same rigor as in natural scientific research (England, 2012). The coding of the data and grouping of ideas and perspectives allowed the data to be delineated into broader themes (Creswell & Plano Clark, 2011).

Research Question 4: Do prelicensure nursing students’ perceptions of deliberate practice explain the quantitative results of the study? To address this question, based on use of the convergent parallel mixed methods design, both the quantitative and qualitative data analysis were completed prior to any mixed method interpretation (Creswell & Plano...
Clark, 2011). The quantitative and qualitative results were interpreted and analyzed as to how the results converged and diverged around the use of deliberate practice to teach urinary catheter insertion skill competency and retention.

Justification for Sample Size

Due to the lack of studies on the use of deliberate practice for skill acquisition and retention in nursing education, the need for an improved research base exists. It was appropriate to conduct a pilot of the intervention to obtain effect size estimates to inform a power analysis for a larger study. Consequently, sample size for the pilot was not based on traditional methods of power analysis. Instead, the sample size was determined by feasibility considerations. The targeted sample size was limited by the number of senior students in the nursing program in the fall 2015 semester who met the study inclusion criteria. A total of 28 students were eligible to participate in the study and 28 participated. Additionally, this study had a timeline constraint for the quantitative and qualitative strands to ensure all data were collected in the participants' senior year of nursing education.

In qualitative research, as opposed to quantitative which focuses on size to reflect the representativeness of a population, the goal is to seek knowledge about the meaning of a phenomenon (England, 2012; Giorgi, 2009). Therefore, experts recommend for the phenomenological method to have at least three participants who have had a particular experience (England, 2012; Giorgi, 2009). Sampling for the qualitative strand involved a purposive selection of participants who were in the deliberate practice intervention group and experienced the phenomenon. The initial sample size in the
strand was five participants from the deliberate practice intervention group. This size allowed the researcher to obtain knowledge of the content of the experience and seek meaning in the phenomenon (Englander, 2012). Additional participants were selected from the HFS with skill integration group to further elaborate on their experiences.

Protection of Human Subjects

The study was submitted and approved by the Mercer University Institutional Review Board (IRB). In addition, the study was submitted and approved by the IRB of the college where the study was conducted. Study related procedures began only after approval by both IRBs. The dean of the nursing division at the college gave administrative approval for the study once all IRB approvals were obtained.

A written informed consent was obtained from each study participant by a consenting faculty intermediary. The use of a consenting faculty intermediary, who had no direct teaching or grading responsibility over the students, to obtain the students’ consent reduced the possible effect of faculty power in the relationship (Ferguson et. al., 2006). Each participant was assigned a unique identifier by the faculty intermediary and participants were referred to by this identifier which allowed the participants to remain anonymous. Confidentiality of the participants’ names and unique identifiers to maintain the privacy of students’ data was insured by the use of the faculty intermediary (Ferguson et al., 2006). All students in the course participated in the HFS scenarios and competency assessments, as the assessment checkoffs are traditional for skill and simulation laboratory evaluation; however, only those participants who consented had their data analyzed or were approached to participate in the qualitative interviews. At the end of
the quantitative portion of the study, following unblinding of all participants, all students were provided the opportunity to attend an open skill practice day. This day, not only provided the opportunity for additional practice with urinary catheter insertion with the researcher and other faculty, but additionally allowed the students to engage in deliberate practice of any previously learned nursing skill.

The faculty intermediary process allowed the students to be protected from possible coercion and provided the students’ assurance that participation was voluntary. In addition, the faculty intermediary assured the students no punitive action would be taken if the student did not wish to volunteer or wished to withdraw at any time during the study (Ferguson et al., 2006). No academic reward or penalty was given to participants. The overall goal of the research was explained and prospective participants were assured of the protection of privacy at all times.

All study materials with any identifying information were stored in a locked file cabinet. The use of print and audio materials was limited to the researcher and to others on a need-to-know basis, and transcriptions were made without identifying information. At the end of the study, the participants were asked to provide contact information after graduation for a possible follow-up survey to this study.

Summary

This chapter has reviewed the rationale for the mixed methods research methodology along with the frameworks for both the quantitative and qualitative data collection and analysis. The mixed method explanatory design was based on Creswell and Plano Clark’s (2011) methodology. The qualitative strand was implemented based
on Giorgi's (1985) data analysis approach. A description of the setting, sample, recruitment and data collection procedures, instrumentation, and an overview of data analysis were provided. In addition, protection of human participants was discussed. This chapter described the interpretive phenomenological research approach using.
CHAPTER 4

RESULTS

This chapter presents the data from the mixed method study examining the effect of three different educational methodologies along with high-fidelity simulation (HFS) on psychomotor skill acquisition and retention in pre-licensure nursing students. Quantitative and qualitative data analysis procedures are described in detail. In addition, strategies implemented to merge the findings of both data sets and results from the merged data analysis will be discussed. A synopsis of the strategies used to maintain trustworthiness and rigor during the research process are also delineated.

Data collection incorporated both the convergent quantitative and qualitative strands. In addition, quantitative data collection and analysis followed the Consolidated Standard of Reporting Trials (CONSORT) 2010 method of reporting a randomized trial. This method of reporting provides a guideline for clear, complete, and transparent reporting of randomized controlled trial research (Schultz, Altman, & Moher, 2010). Figure 3 represents the CONSORT diagram for the quantitative strand (Schultz, Altman, & Moher, 2010).
Fig. 3. Participant Flow Chart Following Consolidated Standards of Reporting Trials (CONSORT) Guidelines

The effect of deliberate practice combined with high-fidelity simulation scenarios on psychomotor skill competency and retention in prelicensure nursing education: A mixed methods pilot study.

 CONSORT 2010 Flow Diagram

Enrollment

- Assessed for eligibility (n=28)
  - Excluded (n=0)
    - Not meeting inclusion criteria (n=0)
    - Other reasons (n=0)
  - Baseline data collected

Randomized (n=28)

Allocation

- Allocated to intervention (n=28)
  - Received allocated intervention
    - Group A (central) (n=8)
    - Did not receive allocated intervention (give reasons) (n=0)
  - Did not receive allocated intervention (give reasons) (n=0)

- Allocated to intervention (n=10)
  - Received allocated intervention
    - Group B (HFS skills) (n=10)
    - Did not receive allocated intervention (give reasons) (n=0)

- Allocated to intervention (n=10)
  - Received allocated intervention
    - Group C (DP & HFS) (n=10)
    - Did not receive allocated intervention (give reasons) (n=0)

Follow-Up

- Lost to follow-up (give reasons) (n=0)
  - Discontinued intervention (give reasons) (n=0)

Analysis

- Analyzed (n=8)
  - Excluded from analysis (give reasons) (n=0)

- Analyzed (n=10)
  - Excluded from analysis (give reasons) (n=0)

- Analyzed (n=10)
  - Excluded from analysis (give reasons) (n=0)

Note: Adapted from Schultz, Altman, & Moher, 2010.
Description of Sample

The sample consisted of 28 pre-licensure nursing students in a single baccalaureate nursing program. Table 1 reports demographic data for the total sample and the three experimental groups. There were 25 females and three males in the sample. Overall, the participants were predominately white with a mean age 21.82 (SD 2.9) years. Only one participant had a prior baccalaureate degree.

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Control Group</th>
<th>HFS with Skills Group</th>
<th>DP and HFS Group</th>
<th>Total</th>
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<td>(Group B) (n=10)</td>
<td>(Group C) (n=10)</td>
<td>(N = 28)</td>
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<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
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<tr>
<td></td>
<td>23.25 (5.2)</td>
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<td>21.4 (0.7)</td>
<td>21.8 (2.9)</td>
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</tr>
<tr>
<td>Education</td>
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<td>Second degree</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>N (%)</td>
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<td>10 (100)</td>
<td>10 (100)</td>
<td>27 (96.4)</td>
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<td>0 (0)</td>
<td>1 (3.6)</td>
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<td>0 (0)</td>
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<td>1 (10)</td>
<td>1 (3.6)</td>
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</tr>
</tbody>
</table>

*Note. M = Mean. SD = Standard Deviation. % = Percent.*
For the question “Have you worked or are currently working as a nursing technician or assistant,” 38% of the control group (Group A), 80% of the HFS with skills integration group (Group B), and 50% of the deliberate practice and HFS group (Group C) indicated yes respectively. Having prior work experience as a nurse technician or assistant was considered a possible control variable due to the potential for increasing participants’ familiarity with certain tasks and the potential for a higher level of confidence in performing skills. In Table 2, results for the total sample and group comparisons are summarized for the prior work experience and for the Likert items measuring confidence and importance of skills. Means were similar across groups. The participants in all the groups felt “somewhat competent” in their ability to perform nursing skills. In addition, the participants in all the groups felt nursing skills were “very important” in becoming a competent nurse and felt practice was “very important” in learning and being able to perform a nursing skill.
Table 2

Comparison of Nurse Tech Experience and Likert Items for Total Sample and Between Groups (N=28)

<table>
<thead>
<tr>
<th>Variable Category</th>
<th>Control Group</th>
<th>HFS with Skills Group</th>
<th>DP and HFS Group</th>
<th>Total (N = 28)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Group A) (n=8)</td>
<td>(Group B) (n=10)</td>
<td>(Group C) (n=10)</td>
<td></td>
</tr>
<tr>
<td>Worked as Nurse Tech</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Yes</td>
<td>0.38 (.52)</td>
<td>0.80 (.42)</td>
<td>0.50 (.53)</td>
<td>.57 (.5)</td>
</tr>
<tr>
<td>No</td>
<td>3 (38)</td>
<td>8 (80)</td>
<td>5 (50)</td>
<td>16 (57)</td>
</tr>
<tr>
<td>Please indicate:</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>How confident you are in your ability to perform nursing skills</td>
<td>3.38 (.52)</td>
<td>3.2 (.63)</td>
<td>3.0 (.47)</td>
<td>3.2 (.55)</td>
</tr>
<tr>
<td>1- Not Confident at all</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>2- Not very Confident</td>
<td>0 (0)</td>
<td>1 (10)</td>
<td>1 (10)</td>
<td>2 (7.1)</td>
</tr>
<tr>
<td>3- Somewhat Confident</td>
<td>5 (62)</td>
<td>6 (60)</td>
<td>8 (80)</td>
<td>68 (19)</td>
</tr>
<tr>
<td>4- Confident</td>
<td>3 (38)</td>
<td>3 (30)</td>
<td>1 (10)</td>
<td>7 (25)</td>
</tr>
<tr>
<td>5- Very Confident</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>How important you view nursing skills are to becoming a competent nurse</td>
<td>4.9 (.35)</td>
<td>5.0 (0)</td>
<td>4.9 (.32)</td>
<td>4.9 (.26)</td>
</tr>
<tr>
<td>1- Not Important at all</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>2- Not very Important</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>3- Somewhat Important</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>4- Important</td>
<td>1 (12)</td>
<td>0 (0)</td>
<td>1 (10)</td>
<td>2 (7.1)</td>
</tr>
<tr>
<td>5- Very Important</td>
<td>7 (88)</td>
<td>10 (100)</td>
<td>9 (90)</td>
<td>26 (93)</td>
</tr>
<tr>
<td>How feel practice is to learning and being able to perform a nursing skill</td>
<td>5.0 (0)</td>
<td>5.0 (0)</td>
<td>4.9 (.32)</td>
<td>4.96 (.19)</td>
</tr>
<tr>
<td>1- Not Important at all</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>2- Not very Important</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>3- Somewhat Important</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>4- Important</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (10)</td>
<td>1 (0)</td>
</tr>
<tr>
<td>5- Very Important</td>
<td>8 (100)</td>
<td>10 (100)</td>
<td>9 (90)</td>
<td>27 (96)</td>
</tr>
</tbody>
</table>

Note. M = Mean. SD = Standard Deviation. % = Percent. Mdn = Median.
Data Analysis for Quantitative Research Questions

Prior to beginning the quantitative data analysis using the software package, Statistical Package for the Social Sciences (SPSS), the data were assessed for normality and also examined to determine if the additional assumptions for one-way analysis of variance (ANOVA) were met including the Levene’s test for homogeneity of variance. No violation of assumptions were noted. The eta squared effect size results were interpreted based on Cohen’s (1988) recommendation and derivation of eta squared from $f (p. 283): \cdot 022 = \text{small effect}, \cdot 06 = \text{medium effect}, \text{and} \cdot 14 = \text{large effect}$. Post hoc tests were not required as none of the $F$ statistics for the ANOVA models were statistically significant. Two-tailed alpha was set at $p < .05$ for statistical significance.

When presenting research, reporting the $p$ value alone is not sufficient and other meaningful measures should be reported to provide a full picture of the research analysis (Tomczak & Tomczak, 2014). For example, effect sizes present the magnitude or strength of the relationship between variables and allow researchers to “communicate the practical significance” of the results (Laken, 2013; Tomczak & Tomczak, 2014). The effect size should be measured after the use of parametric and non-parametric tests and be reported next to the $p$ value to illustrate the strength of preliminary evidence found in a pilot study (Lee et al., 2014; Tomczak & Tomczak, 2014, p. 20). Effect sizes in pilot studies should be displayed along with confidence intervals (Lee, Whitehead, Jacques, and Julious, 2014; Tomczak & Tomczak, 2014). Confidence intervals can be used to describe the range of effects since the study is not formally powered and should be
reported along with effect sizes to assist in illustrating the strength of the relationship between the variables in the study (Lee et al., 2014).

Research Question 1. Do pre-licensure baccalaureate nursing students in the deliberate practice combined with HFS group demonstrate greater skill competency in urinary catheter insertion than students in the traditional HFS scenario group, and HFS skill integration group? To address RQ1, a one-way ANOVA was conducted to compare the means between the three groups on the pre-test and post-test retention assessment. It is important to note the assessments had four related but different variable foci. The four foci are from the urinary catheter insertion competency measurement checklist (see Appendix B) and are as follows: (1) Completed (2) Completed but not in correct order, (3) Not completed/Omitted/Not performed correctly, and (4) Total assessment score. Comparison analysis was run on the total scores for all four variables for each participant.

Pre-test Competency Assessment

Table 3 contains the results of the group comparisons on the pre-test competency assessments. The HFS with skill integration group demonstrated a higher mean on the total score for the assessment compared to the control group and the deliberate practice and HFS group. However, the differences were not statistically significant. A small eta squared effect size of 0.002 was observed for this analysis. These results indicated that all three groups began at approximately the same level for the urinary catheter insertion skill.

The scores for the variable “Completed in Correct Order” demonstrated a higher mean for the deliberate practice and HFS group, compared to the control group and the
HFS with skill integration group. However, no statistical difference was noted between the groups. A small eta squared effect size of 0.01 was observed. For the variable “Completed but not in Correct Order,” the HFS with skill integration group’s mean was higher than the control group and the deliberate practice and HFS group. The differences between the groups were not statistically significant. However, a medium eta squared effect size of 0.13 was observed.

For the variable, “Not Completed or Omitted/Not Performed Correctly,” the deliberate practice and HFS group scored higher compared to the control group and the HFS skill integration group. The \( F \) statistic for the ANOVA scores was not statistically significant. However, a large eta squared effect size of 0.18 was demonstrated. This result would support that the deliberate practice with HFS group’s initial pre-test assessments included a higher rate of errors in performing the urinary catheter insertion procedure than the other two groups.
Table 3

Comparison of Pre-test Competency Assessments for Total Sample and Between Groups (N=28)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control (Group A)</th>
<th>HFS with Skills (Group B)</th>
<th>DP and HFS (Group C)</th>
<th>Total (N=28)</th>
<th>ANOVA</th>
<th>F Statistic</th>
<th>Eta Squared Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test Competency</td>
<td>( M (SD) )</td>
<td>( M (SD) )</td>
<td>( M (SD) )</td>
<td>( M (SD) )</td>
<td>( p )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>( Mdn )</td>
<td>( Mdn )</td>
<td>( Mdn )</td>
<td>( Mdn )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( Min-Max )</td>
<td>( Min-Max )</td>
<td>( Min-Max )</td>
<td>( Min-Max )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( CI )</td>
<td>( CI )</td>
<td>( CI )</td>
<td>( CI )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>18 (2.8)</td>
<td>18.2 (3.3)</td>
<td>17.9 (3.5)</td>
<td>18 (3)</td>
<td>.98</td>
<td>.022</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>18.5</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13-21</td>
<td>14-23</td>
<td>14-25</td>
<td>13-25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15.7-20</td>
<td>15.9-20.5</td>
<td>15.4-20</td>
<td>16.8-19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed in Correct Order</td>
<td>5.5 (2.2)</td>
<td>5.8 (2.7)</td>
<td>6.1 (2.3)</td>
<td>5.8 (2.4)</td>
<td>.87</td>
<td>.135</td>
<td>.011</td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>6.5</td>
<td>5.5</td>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-8</td>
<td>2-10</td>
<td>3-10</td>
<td>2-10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.7-7.3</td>
<td>3.9-7.7</td>
<td>4.4-7.8</td>
<td>5-6.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed but not in Correct Order</td>
<td>7.0 (2.4)</td>
<td>7.6 (2.4)</td>
<td>5.7 (2.1)</td>
<td>6.8 (2.4)</td>
<td>.19</td>
<td>.18</td>
<td>.13(^a)</td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>7.5</td>
<td>6.0</td>
<td>7.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-11</td>
<td>4-12</td>
<td>2-8</td>
<td>2-12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5-9</td>
<td>5.9-9</td>
<td>4.2-7.1</td>
<td>5.8-7.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Completed or Omitted</td>
<td>4.8 (2.1)</td>
<td>4.5 (1.5)</td>
<td>6.2 (1.8)</td>
<td>5.2 (1.9)</td>
<td>.09</td>
<td>2.7</td>
<td>.18(^b)</td>
</tr>
<tr>
<td>/Not</td>
<td>4.5</td>
<td>4.5</td>
<td>6.5</td>
<td>5.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performed</td>
<td>3-9</td>
<td>2-6</td>
<td>2-8</td>
<td>2-9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correctly</td>
<td>3-6.5</td>
<td>3.4-5.6</td>
<td>5-7.5</td>
<td>4.5-5.9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. \( M \) = Mean. \( SD \) = Standard Deviation. \( Mdn \) = Median. \(^a\) indicates a medium effect size for eta squared. \(^b\) indicates a large effect size for eta squared.
Post-test Retention Assessment

Table 4 reports the data from the assessments for the total sample and the comparison between the three groups. The HFS with skill integration group demonstrated a higher mean on the total score for the assessment compared to the control group and the deliberate practice and HFS group. The $F$ omnibus was not statistically significant and a small eta squared effect size of 0.009 was observed for this analysis.

The scores for the variable “Completed in Correct Order” demonstrated a higher mean for the HFS with skill integration group, compared to the control group and the deliberate practice and HFS group. However, no statistical significance was found and a small eta squared effect size of 0.0007 was observed. For the variable “Completed but not in Correct Order,” the control group’s mean was higher than the HFS with skill integration group and the deliberate practice and HFS group. No significant statistical difference was found and a small eta squared effect size of 0.02 was observed.

For the variable, “Not Completed or Omitted/Not Performed Correctly,” the deliberate practice and HFS group and the HFS with skill integration groups’ scores were identical and comparable to the control group. No significant statistical difference was noted and no eta squared effect size (0.00) was found. In summary, at the post-test retention assessment no clinically meaningful or statistically significant differences between the groups were observed.
Table 4

Comparison of Post-test Retention Assessments for Total Sample and Between Groups (N=28)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group (Group A) (n=8)</th>
<th>HFS with Skills Group (Group B) (n=10)</th>
<th>DP and HFS Group (Group C) (n=10)</th>
<th>Total (N=28)</th>
<th>ANOVA Statistic</th>
<th>Eta Squared</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-test Retention Assessment</td>
<td>M (SD) CI</td>
<td>M (SD) CI</td>
<td>M (SD) CI</td>
<td>M (SD) CI</td>
<td>p value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>18.6 (3.3) 18.5 12-23</td>
<td>19.3 (2.5) 20.5 15-22</td>
<td>18.9 (3.1) 15-25</td>
<td>19 (2.9)</td>
<td>.89 .12 .009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed in Correct Order</td>
<td>3.9 (1.6) 4.0 1-6</td>
<td>4.0 (2.0) 4.5 1-7</td>
<td>3.9 (2.3) 4.0 0-9</td>
<td>4 (2)</td>
<td>.99 .01 .001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed but not in Correct</td>
<td>11.9 (3.0) 12.5 7-15</td>
<td>11.4 (2.2) 12.0 7-14</td>
<td>11.1 (2.2) 9.9-13</td>
<td>11.4</td>
<td>.8 .22 .02</td>
<td>.99 .001</td>
<td>.00</td>
</tr>
<tr>
<td>Order</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Omitted/Not Performed</td>
<td>2.6 (1.9) 2.5 0-5</td>
<td>2.6 (1.1) 3.0 1-4</td>
<td>2.6 (1.1) 3.0 1-4</td>
<td>2.6 (1.3)</td>
<td>.99 .001 .00</td>
<td>.99 .001</td>
<td>.00</td>
</tr>
<tr>
<td>Correctly</td>
<td>1.4 1.8-3.4</td>
<td>1.8-3.4</td>
<td>1.8-3.4</td>
<td>2.1-3.1</td>
<td>.99 .001 .00</td>
<td>.99 .001</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note. M = Mean. SD = Standard Deviation. Mdn = Median. CI = Confidence Interval.

Research Question 2: Do pre-licensure baccalaureate nursing students in the deliberate practice combined with HFS group demonstrate greater skill retention in urinary catheter insertion than students in the traditional HFS scenario group, and HFS skill integration group? To address RQ2, a one-way ANOVA was conducted to compare the means between the three groups on the post-test retention assessment. Table 5
contains the results for the total sample and the group comparisons for the post-test retention assessments.

For the post-test retention assessment, the deliberate practice and HFS group demonstrated a higher mean on the total score for the assessment compared to the control group and the HFS with skill integration group. No statistically significant result was noted; however, the magnitude of the eta squared effect size result was medium at 0.06. The scores for the variable “Completed in Correct Order,” the control group demonstrated a higher mean than the HFS with skill integration group and the deliberate practice and HFS. While no statistical difference was noted between the groups, the observed eta squared effect size was medium at 0.13.

For the variable “Completed but not in Correct Order,” the deliberate practice and HFS group’s mean was higher than the control group and the HFS with skill integration group. No significant statistical difference was found but a large eta squared effect at 0.24 was observed. This result supports that the DP and HFS group completed a higher proportion of the steps correctly. For the variable, “Not Completed or Omitted/Not performed correctly,” the deliberate practice and HFS group was lower than the HFS with skill integration group scores and the control group. No significant statistical difference was noted; however, a large eta squared effect of 0.16 was observed. This score reveals a lower amount of error in performing the urinary catheter insertion in the deliberate practice and HFS group.
Table 5

Comparison of Post-Test Retention Assessments for Total Sample and Between Groups (N=28)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group (n=8)</th>
<th>HFS with Skills Group (n=10)</th>
<th>DP and HFS Group (n=10)</th>
<th>Total ANOVA M (SD)</th>
<th>F Statistic</th>
<th>Eta Squared Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>Mdn</td>
<td>Min-Max CI</td>
<td>M (SD)</td>
<td>Mdn</td>
<td>Min-Max CI</td>
</tr>
<tr>
<td>Total Score</td>
<td>19.9 (3.4)</td>
<td>20.5</td>
<td>14-23</td>
<td>20.7 (2.4)</td>
<td>21.0</td>
<td>16-24</td>
</tr>
<tr>
<td>Completed in Correct Order</td>
<td>5.1 (1.8)</td>
<td>3.7 (1.5)</td>
<td>2.6-4.8</td>
<td>4.3 (1.3)</td>
<td>4.0</td>
<td>3.3-5</td>
</tr>
<tr>
<td>Completed but not in Correct Order</td>
<td>10.1 (1.6)</td>
<td>11.6 (0.5)</td>
<td>10.0</td>
<td>12.1 (1.3)</td>
<td>12.5</td>
<td>8-13</td>
</tr>
<tr>
<td>Not Completed Or Omitted/Not Performed Correctly</td>
<td>2.9 (1.6)</td>
<td>2.6 (1.8)</td>
<td>1.6-2.9</td>
<td>1.4 (1.2)</td>
<td>1.0</td>
<td>1.4-2.9</td>
</tr>
</tbody>
</table>

Note. M = Mean. SD = Standard Deviation. *indicates a medium effect size for eta squared. b indicates a large effect size for eta squared.

Based on the result indicating the DP with HFS group began with a higher error rate than the other two groups, an alternate approach to data analysis was used. A dependent variable, called "error reduction" was calculated by subtracting the post-test competency assessment score from the pre-test assessment score and running a one-way ANOVA to compare the three groups on the error reduction variable. While the
differences between the groups were not statistically significant, a medium effect size was observed. The magnitude of the effect size supported the DP and HFS group demonstrated greater reduction in errors performing the urinary catheter insertion skill competency than the other two groups. Table 6 reports the data from the error reduction analysis.

Table 6

Comparison of Error Reduction for Total Sample and Between Groups (N=28)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group (n=8)</th>
<th>HFS with Skills Group (n=10)</th>
<th>DP and HFS Group (n=10)</th>
<th>Total</th>
<th>ANOVA</th>
<th>F Statistic</th>
<th>Eta Squared Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error Reduction</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>p value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>Mdn</td>
<td>Min-Max CI</td>
<td>Mean</td>
<td>Mdn</td>
<td>Min-Max CI</td>
<td>Mean</td>
<td>Mdn</td>
</tr>
<tr>
<td>Total Score</td>
<td>2.1 (3.0)</td>
<td>1.9 (1.7)</td>
<td>3.6 (2.4)</td>
<td>2.5 (1.9)</td>
<td>0.2</td>
<td>1.7</td>
<td>.12*</td>
</tr>
<tr>
<td>2.0</td>
<td>1.5</td>
<td>4.0</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2.8</td>
<td>0.5</td>
<td>0-6</td>
<td>-2.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-4.7</td>
<td>7-3.1</td>
<td>2.2-4.9</td>
<td>1.7-3.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. M = Mean. SD = Standard Deviation. Mdn = Median. CI = Confidence Interval. * indicates a medium effect size for eta squared.

Additionally, a comparison between the pre-test total assessment scores, the post-test assessment scores, and the post-test retention score for the total sample and between groups was completed. While no significant statistical result was found, a medium eta squared effect size was revealed between the groups for the post-test retention scores. The control group and the HFS with skill integration group means on the total score increased 1.9 and 0.8 respectively from the pre-test to the post-test retention assessment.
total scores. However, the DP and HFS groups' total score mean increased 2.8. This increase in mean total scores revealed a higher level of retention of competency in the urinary catheter insertion skill among the DP and HFS group. Table 7 presents the comparison of total assessment scores for the total sample and between the three groups.

Table 7

Comparison of Total Assessment Scores from Pre-Test, Post-Test Competency Assessments, and Post-Test Retention Assessment for the Total Sample and Between Groups (N=28)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group (Group A) (n=8)</th>
<th>HFS with Skills Group (Group B) (n=10)</th>
<th>DP and HFS Group (Group C) (n=10)</th>
<th>Total (N=28)</th>
<th>ANOVA F Statistic</th>
<th>Eta Squared Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-test Competency Assessment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>M (SD) = 18 (2.8)</td>
<td>M (SD) = 18.2 (3.3)</td>
<td>M (SD) = 17.9 (3.5)</td>
<td>M (SD) = 18 (3.1)</td>
<td>.98</td>
<td>.022</td>
</tr>
<tr>
<td></td>
<td>Mdn = 18.5</td>
<td>Mdn = 18</td>
<td>Mdn = 18</td>
<td>Mdn = 18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min-Max CI</td>
<td>Min-Max CI</td>
<td>Min-Max CI</td>
<td>Min-Max CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Post-test Competency Assessment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>M (SD) = 18.6</td>
<td>M (SD) = 19.3 (2.5)</td>
<td>M (SD) = 18.9 (3.1)</td>
<td>M (SD) = 19 (2.9)</td>
<td>.89</td>
<td>.12</td>
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<td>Min-Max CI</td>
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<tr>
<td>Total Score</td>
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<td>M (SD) = 19 (3)</td>
<td>M (SD) = 20.7 (2.4)</td>
<td>M (SD) = 19.9 (2.9)</td>
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*Note. M = Mean. SD = Standard Deviation. Mdn = Median. *indicates a medium effect size for eta squared.
Data Analysis for Qualitative Research Questions

Research Question 3: *What are the pre-licensure nursing students’ perceptions of the effectiveness of deliberate practice on urinary catheter insertion skill competency and retention?*

A total of seven students participated in the qualitative interviews with five out of ten participants from the deliberate practice combined with HFS group, and two out of ten participants from the HFS skill integration group. An experienced research transcriptionist was hired to transcribe the digitally recorded interviews. A copy of the audio file from the recorder was downloaded into a protected Dropbox account in which only the transcriptionist, the researcher, and the dissertation chair had access. The transcriptions were typed in Microsoft Word by the transcriptionist and loaded into the Dropbox file. All transcriptions were checked for accuracy by the researcher. A field journal was maintained and field notes were analyzed along with the transcription to ensure an accurate representation of what participants expressed in the interviews. Confidentiality was maintained throughout the interview, transcription, and analysis process. Pseudonyms for participants were chosen by the researcher and used by the transcriptionist to maintain the privacy of the participants.

First cycle coding was conducted by the researcher and dissertation chair to identify topics and give priority to the participants’ voice (Saldaña, 2013). Therefore, first cycle coding consisted of *descriptive* and *in vivo* coding. *Descriptive* coding, according to Saldaña (2013, p. 88), “summarizes in a word or short phrase . . . the basic topic of a passage of qualitative data.” In addition, Saldaña (2013) characterizes
descriptive coding as the underpinning for qualitative inquiry which should focus on identifying the topic being discussed instead of just condensing the content.

For additional coding during the first cycle, in vivo coding was used to identify the participants' voices by using actual phrases or words found in the qualitative data to enhance actual understanding of the experiences recalled by the participants (Saldaña, 2013). The use of descriptive and in vivo coding led to an index combining the data’s contents. In addition, the qualitative data were entered into a Microsoft Excel spreadsheet to store and label text segments for coding, and to organize codes to search for relationships (Creswell & Plano Clark, 2011).

Upon completion of first cycle coding for the first five interviews, the researcher and dissertation chair met to review the preliminary findings. At this meeting, initial themes were identified. This review of findings led to preliminary second cycle coding in which pattern coding was used to search for causes and explanation in the data and identify the development of underlying themes. Pattern coding allowed the researcher and dissertation chair to cluster together the coded data and to identify explanatory subcategories into meaningful emergent themes (Saldaña, 2013). Potential initial themes formed were participant emotions when performing skills during HFS, participant emotions during peer-to-peer practice, perceptions of own skill checkoffs, and the meaning of skill acquisition. The perceptions of peer-to-peer practice expressed by participants in the deliberate practice combined with HFS group (Group C) led to an identified need for additional interviews in the group who participated in HFS with skill integration which incorporated peer-to-peer practice (Group B). Therefore, the
researcher obtained consent from two participants in Group B and performed two additional interviews to further explore the use of peer-to-peer skill practice (see Appendix E, Interview Guide Two).

After the additional two interviews were completed and transcribed, the researcher met again with her dissertation chair to review for any additional findings and refine the preliminary identified themes. The preliminary themes found in the previous pattern coding had been entered into an Excel spreadsheet to further facilitate identifying any changes or new subthemes when adding the new findings from Interview F and Interview G. Pattern coding was again used to explore the new data and merge any additional identified themes into meaningful major themes. Three main themes were identified by the researcher and dissertation chair through the integration of reflection, discussion, thematic analysis, and pattern coding. The three themes reflected the lived experiences of learning during performing skills for faculty, peer-to-peer learning and during HFS skill integration. The themes identified included Not the Best Place for Learning a Skill, Learning Skills with Peers, and Performing Skills for a Grade.

Theme 1: Not the Best Place for Learning a Skill

The theme, Not the Best place for Learning a Skill, was formed based on descriptions by the interviewed students about what it feels like when performing a skill during a HFS scenario. The participants described the experience of doing urinary catheter insertion on a patient during a HFS scenario as stressful and fast-paced with a feeling of real time performance. For example, John said:

I believe that practicing in the scenario, ah, implements a little bit more, um, real life into the whole procedure because in the scenarios we’re trying to do
everything so fast because often the patient will, will develop an issue, or crash, or something like that, and I mean, you, you try to get it done in, in the hospital. You need to get it done. You know, you’ve got four other patients to see during the day.

The participants stated they felt added pressure and more self-conscious when performing the skill during a HFS scenario due to the instructor and peers watching, and the patient asking questions which the participant had to respond to while inserting the catheter. Other comments about the in-scenario practice included the experience helped to prepare the student for clinical, helped to apply learning, and provided the value of a more realistic environment.

Theme 2: Learning Skills with Peers

The theme, Learning Skills with Peers, was based on the participants’ perceptions during peer-to-peer skill practice. The participants in the deliberate practice group engaged in peer-to-peer deliberate practice of the urinary catheter insertion skill for 20 minutes prior to the start of each simulation session. The experience of peer-to-peer practice by this group was described as a more relaxed, comfortable, and helpful practice time that provided an opportunity for reflection. For example, Robert described peer-to-peer practice:

It’s nice being able to see, you know, right there what you miss in your procedure without hurting somebody. Um, it was also nice for me to, I, you know, practicing before Sim I would see other people doing it and I do really well watching like, “Oh, I would do this,” so it gets my pattern more engrained into me.

The participants described this time as one where they could concentrate on the skill, identify their own mistakes by watching peers, and being able to self-correct and improve their skill ability. The participants felt their own skills improved as they watched their peer, they were able to identify mistakes, get a full picture of the skill, and
observe from the outside looking in. When describing peer-to-peer practice, Mary said “any time that I saw somebody do something wrong, or they saw me do something wrong, we would correct each other . . . we definitely called each other out, but it was very relaxed.” Participants further described the activity as a way to learn better, ingrain patterns, get the basics down, and develop muscle memory.

For the HFS with skill integration group, similar descriptions were made during the time of peer-to-peer practice before each simulation session. This group practiced a different skill prior to each session and only practiced urinary catheter insertion during HFS scenarios. The researcher reviewed a different skill which had been learned in the students’ junior year, and then the participants engaged in peer-to-peer practice of the specific skill. This group described the peer-to-peer practice as helpful, a good refresher with not as much pressure. For example, Kendra described this experience: “I think for me almost it’s more helpful sometimes watching someone else ‘cause then you actually see, oh, maybe they should have done it his way, or, they shouldn’t have done that first, so, I did like that.” Overall, the participants in this group felt watching their peer helped them to identify their own mistakes, remember details in the steps, and identified reviewing with a peer as helpful. This group also liked the concept of reviewing skills previously learned to be able to perform the skill better.

Overall, both groups described peer-to-peer practice as very important in regards to confidence and ability. Consistent practice provided a time to “learn the order of the steps,” and allowed the participant to “become more confident in clinical.” In addition,
the participants described their feelings about the importance of skill practice and “not learning on the patient.”

Theme 3: Performing Skills for a Grade

The theme, *Performing Skills for a Grade*, was based on the deliberate practice and HFS participants’ descriptions of emotions experienced during faculty supervised skill checkoffs in which the urinary catheter insertion competency measurement checklist was used for evaluation purposes. The first checkoff experience was described as “nerve-wracking,” “I couldn’t remember,” “nervous,” “hadn’t practiced since junior year,” and how to perform it “slipped off my mind.” When describing his feelings during the first checkoff, Robert said “we knew we had a checkoff but we didn’t know for what, so we walked in there and I, I can’t remember the last time I did a catheter before that.” Diana described feeling nervous and thinking “I don’t know if I will remember this.”

The second checkoff occurred after the participants’ had practiced urinary catheter insertion during four peer-to-peer practice sessions. The participants’ described the emotions associated with this checkoff as “more comfortable,” “improved a lot,” “forgot some things,” “better, familiar, and much easier,” and a time to “reflect on learning.” For example, Nancy said “I felt much better, more familiar with it; I’d done it a lot more; I remembered things that I’d forgotten last time. So it was much easier.”

The third checkoff experience occurred seven weeks after the second checkoff. The group had not practiced the skill during this seven week period. Descriptions for this checkoffs included: “did it with minimal mistakes,” “no big deal,” “more relaxed but I needed more practice,” “really wasn’t bad,” and “not as comfortable but more familiar.”
Also, one of the participants discussed the importance of practicing skills in nursing school. John stated:

I personally believe that the lack of practicing skills, and that the way that, ah, nursing schools are getting away from practicing skills is kind of... is almost a little bit detrimental to the nursing profession because I mean, this is where you’re supposed to learn those.

Data Analysis for Mixed Methods Research Question

Research Question 4: Do prelicensure nursing students’ perceptions of deliberate practice explain the quantitative results of the study? To address RQ4, both the quantitative and qualitative strands results were brought together by looking for consistencies and inconsistencies between the two data sets (Creswell & Plano Clark, 2011). As a group, all participants in the sample felt “somewhat competent” in their ability to perform nursing skills and reported skill acquisition as “very important” in becoming a competent nurse. The finding suggested the participants started at approximately the same confidence level in the skill despite any previous work experience as a nurse tech or assistant. In addition, the mean scores for all groups on the pre-test competency assessment indicated the participants begin at approximately the same level of skill proficiency. This finding correlates to the participants’ reported confidence in their skill levels. These findings were confirmed in the qualitative data where participants voiced “practicing skills helped me have confidence in clinical,” and “it was nice to be in an environment actually to practice those skills again.” For example, when discussing practicing the skill over time, Diana stated “I feel like the difference was the mentality, mostly, was I felt there was less of, “I can’t do it,” versus “I know this and
I know I'm continually improving on this. I know I can do it.” As Robert expressed “also just the confidence behind me doing it in simulation helped a lot too. I wasn’t as nervous so I could think clearly, and that was a big plus.” Similarly, Mary expressed confidence in her urinary catheter insertion skills after deliberate practice and stated:

Going into the hospital I certainly feel comfortable putting in a Foley on a real person. . . but, um, a lot of the other skills that we checked off on, it’s gonna be intimidating the first few times that I have to do it, for sure, just because we haven’t practiced those as much. Additionally, all participants felt nursing skills were very important in becoming a competent nurse. This finding indicated all participants felt the ability to be able to perform skills correctly was important in nursing practice. Moreover, these findings correlated with the qualitative data. For example, Nancy said “I think it would have been beneficial to us as students, maybe junior year, doing more skills regularly.” And Mary expressed:

I am so glad I got the extra practice and stuff because that is a skill that we’re gonna have to do on a regular basis in the hospital, and it’s one that if you mess it up you’re potentially going to kill your patient with something that’s so simple.

Additional comments included how the participants felt about the importance of consistent practice, how practice helps to learn the order of the steps, and how doing skills during simulation brings a more contextual meaning to the skill.

In comparing the groups’ scores on the pre-test competency assessment for the category “Not Completed or Omitted/Not Performed Correctly,” a large eta effect size was found. Based on this result, the deliberate practice with HFS group’s (Group C) initial pre-test assessments included a higher rate of errors in this group when performing the urinary catheter insertion skill. Based on these results, an error reduction score was
obtained after the first post-test assessment. The result indicated the DP and HFS group (Group C) demonstrated a greater improvement in their urinary catheter insertion skill through deliberate, consistent practice and reduced their amount of error in performing the skill. This was supported in the qualitative findings expressed by participants when discussing the benefit found in peer-to-peer practice and practice during simulation scenarios.

An important finding in the qualitative data, which was not examined in the quantitative data, was participants’ positive perceptions of peer-to-peer practice. All participants perceived peer-to-peer practice as helping and provided a less stressful and pressured environment. Additionally, the peer-to-peer practice was felt to be a time for the learner to able to self-evaluate and self-reflect on their own skill. As John said:

I felt like the more I practiced it the more it became just a, a like, almost like a, um, natural going through the motions kind of, but you always thought about what you were doing just because of the, the ah, consequences of doing it wrong.

Robert expressed in reference to peer-to-peer practice “it’s nice being able to see, you know, right there what you miss in your procedure without hurting somebody.” Others stated “it really drove in the catheter skills,” “it’s easier . . . to observe from the outside,” and “it was less stressful.” Kendra expressed “peer-to-peer is nice because there’s not as much pressure . . . and you have time to watch somebody else, and say, “Oh maybe you should try this way,” or you kind of can critique each other which is helpful.”

The deliberate practice and HFS group demonstrated a higher mean on the total score for the second post-test assessment compared to the other two groups. A higher total score on the assessment indicated a higher competency in performing the skill of
urinary catheter insertion. This finding is supported by the qualitative data in which the participants felt the deliberate practice of the skill before each simulation session helped and allowed the students to identify and correct their own mistakes. For example, John said “If I did anything wrong I knew” and “it gives you time to self-evaluate and, and reflect on how you did that.” The practice during the simulation scenarios were also found to be helpful in refining their skills. For instance, Robert stated “I think putting it in simulation probably helped some more...” and Diana expressed “…so I think that was better for me getting to use my skills, um, in that context because that’s more of the hospital context.” In addition, the group felt practicing a skill before doing the skill during a simulation scenario added to reinforcing learning. As Diana said “Just being able to go through simulation again and then also doing the practice beforehand, like, I feel like that really drove in the catheter skills.” Also Mary expressed “It was helpful just because then you were having to do it again, but it was with a little bit of added pressure.”

Trustworthiness/Rigor for Quantitative and Qualitative Strands

Trustworthiness and rigor should be maintained in both quantitative and qualitative researchers (Polit & Beck, 2012). In quantitative research, rigor is maintained by a standard, linear procedure for collecting and analyzing the data based on statistical procedures (Creswell & Plano Clark, 2011). Rigor and internal validity for the study were maintained through randomization of participants into three intervention groups, maintaining standardization in the HFS scenarios through the use of preprogrammed scenarios for intervention fidelity, and the use of videoing at least 50% of the assessments.
for interrater reliability. As this was a pilot study, external validity with respect to the generalizability of the study findings was not a major emphasis. Evidence supporting measurement reliability was obtained by demonstrating strong interrater reliability for the competency assessments (Krefting, 1991; Polit & Beck, 2012).

Qualitative rigor was maintained by the researcher by collecting accurate information from the participants (Creswell & Plano Clark, 2011). Lincoln & Guba (1985) developed a framework for criteria in determining the trustworthiness of the qualitative inquiry. The four criteria consisted of credibility, dependability, confirmability, and transferability (Lincoln & Guba, 1985). Credibility, or truth value, refers to the accuracy and truth in the findings and interpretations of the study (Krefting, 1991; Lincoln & Guba, 1985). This criterion was met by spending sufficient time with the participants to allow them to become accustomed and familiar to the researcher, therefore providing an adequate period of time to discover any recurrent patterns (Krefting, 1991). In addition, descriptions and/or interpretations of the participants' experiences of deliberate practice were accurately documented and throughout the inquiry the researcher used journaling to provide accurate documentation of decision trails (Krefting, 1991; Lincoln & Guba, 1985; Polit & Beck, 2012).

Dependability, or consistency, is based on the reliability of the data over time and if the findings would be replicated in a similar context (Krefting, 1991; Lincoln & Guba, 1985). Accurate transcriptions with trackable variability of identified sources with possible explanations were kept (Krefting, 1991). First and second cycle coding with a focus on patterns and themes along with a dense description of the phenomenon and strict
adherence to the research method also demonstrated dependability in the study.

Additionally, the researcher examined the deliberate practice experience from multiple viewpoints and not just the average experience (Krefting, 1991).

Confirmability, or neutrality, represents the congruence between the researcher’s description of the phenomenon and the data the participants actually provided without researcher bias (Krefting, 1991; Lincoln & Guba, 1985). Neutrality or objectivity is achieved through rigor of methodology and the ability of the researcher to be influenced only by the data and not preconceived biases (Krefting, 1991). In addition, the process of reflexive analysis was completed by the researcher by periodically reviewing journal notes for bias or researcher influence (Krefting, 1991).

Finally, transferability, or applicability, is the ability to provide enough dense, descriptions of the participants’ experiences so that other researchers can make thoughtful decisions about whether the findings can be transferred to another setting or group (Lincoln & Guba, 1985). To meet this criterion, field notes were kept along with accurate transcription of the interviews to provide sufficient information for comparison to another situation or population (Krefting, 1991; Polit & Beck, 2012). Adequate records were maintained by the researcher to allow others the ability to transfer possible findings to another group (Krefting, 1991).

Summary

The researcher reviewed the quantitative and qualitative results to explain and add insight to the merged results. The goal during the results phase was to interpret findings and provide an overview of what was learned in the study (Creswell & Plano Clark,
2011). Each strand was reported separately to provide a clear delineation of the results in each phase and a report on how the qualitative and quantitative results were correlated and identified relationships were also included (Creswell & Plano Clark, 2011). Finally, strategies used within the study to ensure trustworthiness and rigor were delineated.
CHAPTER 5
DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

This chapter provides a discussion and interpretation of the study findings. Based on the findings from both strands of data, along with the merging of those findings, recommendations and implications for nursing education and practice are addressed. Next, recommendations for future research are presented along with the limitations of this study. Finally, the chapter highlights how this study assisted in answering the call for transformation in nursing education and the need for developing the science in nursing education (Broome, Ironside, & McNelis, 2012; Institute of Medicine, 2011).

Discussion of Findings

A mixed method pilot study was conducted on the use of three different teaching methodologies for skill acquisition and retention. The study explored the combination of deliberate skill practice with skill practice during high-fidelity simulation (HFS) to improve skill acquisition and retention in pre-licensure nursing students. The findings of this study highlighted the importance of skill practice in nursing education and are consistent with current literature indicating the need for repetitive skill practice with feedback to promote skill competence in graduates (Chee, 2014; Liou et al., 2013; Oermann et al., 2015; Oermann, 2016; Ross et al., 2015).
Student Skills Perceptions

Students reported feeling “somewhat competent” in skills in the quantitative strand. Additionally, students indicated nursing skills were “very important in becoming a competent nurse, and practice was “very important” in learning and being able to perform a skill. Based on these responses, students perceived skill acquisition and retention as being very important to them during their nursing education. Additionally, these findings were reflected in the qualitative strand where students expressed the use of deliberate practice during peer-to-peer practice promoted a less stressful learning environment which led to an overall improved skill ability. This environment allowed students to identify their own mistakes and correct themselves. The student perceptions are consistent with several recent medical education research articles which found peer-to-peer, or dyad practice, promoted observational learning and individual reflection (Bjerrum et al., 2014; Räder et al., 2014; Tolsgaard et al., 2014). Additionally, the students felt repeating the skill in a simulation scenario reinforced the learning of the skill and provided a more contextual hospital-like environment. This finding is consistent with recent literature recommending the use of real life simulation scenarios to promote skill development and augment clinical learning (Cannon-Diehl, 2009; DeBourgh, 2011; Harder, 2010; Moule, 2011; Richardson & Claman, 2014). Also, this finding correlates with past research which has shown confidence and self-efficacy increase as a result of learning during simulation (Foronda et al., 2013).
Students' Baseline Urinary Catheter Insertion Skill Competency

The pre-test urinary catheter insertion competency measurement assessments, based on the total mean score for each group, revealed the students began at approximately the same level of proficiency for this skill. The control group (group A), HFS with skills group (group B), and the deliberate practice with HFS group (group C) total scores were 18.5, 18, and 18 respectively. The students had completed initial instruction and assessment of the urinary catheter competency skill in their junior year. Based on the results of the pre-test assessment, in which the average mean was 18 out of a total possible score of 36, the students did not demonstrate mastery in this skill. Consequently, all students began at the same proficiency level which provided an ideal environment for peer-to-peer (or dyad) practice for skills training (Tolsgaard et al., 2014).

The majority of students began with a "somewhat competent" confidence level and a pre-test assessment median total score of 18 out of 36. These results are congruent with previous research which found a significant correlation between confidence and competence scores (Mould et al., 2011). The previous research results corresponded with the findings at the beginning of the study in which students' confidence and competence levels were similar.

It is also important to note the results from the comparison of the first pre-test competency assessments between the groups. For the variable of "Completed but not in Correct Order," the HFS with skill integration group's mean score was higher with a medium eta squared effect size noted (0.13). This result may be due to the small sample size of the pilot study and would possibly have been corrected if a larger sample had been
available. Also in the pre-test assessment results, it was noted for the variable “Not Completed or Omitted/Not Performed Correctly,” a large eta squared effect size (0.18) was found. This finding indicated the deliberate practice with HFS group’s initial pre-test competency assessments demonstrated a higher rate of errors in performing the urinary catheter insertion skill. Again, with the small sample the randomization did not provide consistent equalization between the groups and therefore some differences were noted in the group comparisons.

Students’ Post-Intervention Urinary Catheter Insertion Skill Competency

Based on the finding of the increased errors in the first pre-test competency assessment in the deliberate practice with HFS group, an error reduction score was calculated. The error reduction score, obtained by subtracting the first post-test assessment score from the pre-test assessment score, demonstrated a medium eta squared effect size (0.12). This finding demonstrated a greater reduction in errors in performing the skill in the deliberate practice and HFS group. This result correlates with research indicating when students learn to perform a skill and practice consistently skill competency is gained over time (Jeffries et al., 2011; Liou et al., 2013; Oermann et al., 2011). This result also correlates with the qualitative data theme, *Learning Skills with Peers*, in which students discussed how peer-to-peer deliberate practice enabled them to identify their own mistakes, self-correct, and improve their own skill ability.

Students’ Urinary Catheter Insertion Skill Retention

The deliberate practice and HFS group demonstrated a higher mean on the total score for the second post-test assessment compared to the control group and the HFS with
skill integration group with a medium eta squared effect size result (0.06). This assessment finding looked at retention of the skill by the students. In the control group (group A) and the HFS with skills group (group B), the second post-test total mean scores improved two points; however, the DP and HFS group’s (group C) overall mean score improved three points. While this result is not statistically significant, a medium eta squared effect size was noted. Thus, the intervention of combining deliberate skill practice prior to HFS along with skill practice during HFS had a direct effect on the dependent variable (urinary catheter insertion competency assessment).

In addition, for the variable, “Completed but not in Correct Order,” the deliberate practice and HFS group’s mean was higher than the control group and the HFS with skill integration group and a large eta squared effect (0.24) was found. For this variable, the deliberate practice and HFS group demonstrated a greater increase in competency in the urinary catheter insertion skill. The effect sizes demonstrated the strength of the independent variable’s (teaching method) influence on the dependent variable (skill competency). Similarly, for the variable, “Not Completed or Omitted/Not performed correctly,” the deliberate practice and HFS group mean was lower than the HFS with skill integration group and the control group. A large eta squared effect size (0.16) was found which suggested that the deliberate practice of the urinary catheter insertion skill had a strong effect on the reduction of errors.

Additionally, the results were congruent with the findings of the qualitative strand on the positive effects of deliberate, peer-to-peer practice. These findings are consistent with the review of literature on the use of deliberate practice in developing skill mastery.
in nursing education (Gonzalez & Sole, 2014; Jeffries et al., 2011; Oermann et al., 2011). Also from the post-test retention total mean scores, it is relevant to note the control group and HFS with skills group demonstrated the same improvement level in the urinary catheter insertion skill. This result is despite the fact the HFS with skills group had performed the urinary catheter insertion skill in their scenarios and the control group did not. For the HFS with skills group, the lack of deliberate practice to improve and refine their skills before performing in an HFS scenario did not provide the same opportunities for skill improvement as the deliberate practice group. This finding corresponds to the data from the qualitative strand theme, Not the Best Place for Learning a Skill, in which the students described performing skills during an HFS scenario as “stressful,” and “fast-paced” with the added pressure of peers and the instructor watching. However, the participants from the deliberate practice with HFS group described performing skills during a HFS scenario as a “helpful,” and it provided “real life” practice time. It is important to note these participants had the deliberate practice time to develop and refine their skills which allowed performance improvement to occur during HFS. These findings correlate with several recent research articles which have found a one-time competency validation on a skill is not enough for students to obtain skill mastery or retention and skills need to be repeated throughout the curriculum to develop competent performance (DeBourgh, 2011; Gonzalez, & Sole, 2014; Oermann et al., 2011).

Significance of Study

The significance of the study was reflected in the quantitative and qualitative findings. These findings correlated well with previous research on the use of the
framework of deliberate practice for skill acquisition and retention in medical education (Duvivier et al., 2011; Gifford & Fall, 2014; Kulasegaram, Grierson, & Norman, 2013; McGaghie et al., 2011) and in the limited research in nursing education (Garrett et al., 2010; Oermann, Kardong-Edgren, & Odom-Maryon, 2011; Ross, 2015). The quantitative findings demonstrated an improvement in skill acquisition and retention in the intervention group which performed deliberate practice of the urinary catheter insertion skill prior to each simulation session and also during all HFS scenarios. The qualitative findings converged with the quantitative findings and strengthened the study findings. In the qualitative strand, participants provided rich descriptions of how peer-to-peer deliberate practice provided a less stressful learning environment in which students could learn through watching others, self-correction, and self-reflection. The additional practice in HFS scenarios allowed students to perform the learned skill in a more realistic and contextual environment. The participants’ view of learning during peer-to-peer practice correlates with Ericsson’ framework of deliberate practice for expert performance. The framework also emphasizes the need for repetition, immediate feedback, and self-reflection for focused skill improvement.

In addition, the study found improvements in skill performance does not occur by practicing the skill during HFS scenarios alone. The HFS with skills group did not demonstrate any improvement in skill competency over the control group even though this group practiced the urinary catheter insertion skill during every HFS scenario. These findings correlate with the deliberate practice with HFS groups’ perceptions of the importance of peer-to-peer practice prior to simulation. The theme, Not the Best Place
Learning a Skill, was based on the participants' perceptions of performing a skill during a HFS scenario. A HFS scenario provides a stressful, fast-paced environment in which the participant relies on prior consistent practice and familiarity of the steps in the skill to be able to perform well. Consistent practice is the key to being able to effectively apply the skill during a HFS scenario with a more contextual meaning.

Additionally, these findings confirm a one-time skill assessment checkoff followed by the incorporation of the skill into HFS does not provide the best learning. A period of deliberate skill practice to refine and develop skill expertise may be advantageous prior to the student performing the skill in the contextual HFS environment. Then incorporation of skills during HFS to provide a bridge between performing tasks during simulation and clinical learning.

Implications for Findings for Theory

The findings of this study are consistent well with Ericsson's framework of deliberate practice. The participants in the deliberate practice with HFS group demonstrated an improvement in the overall total mean scores on urinary catheter insertion assessment. Ericsson (2006) stated “the core assumption of deliberate practice is that expert performance is acquired gradually.” By combining Ericsson's framework of deliberate practice with the NLN/Jeffries framework for simulation design, a new theory on skill practice and acquisition could be developed. The NLN/Jeffries educational practices framework includes the use of active learning to promote knowledge and retention (Jeffries & Rogers, 2012). The hands-on active learning of skill practice could be incorporated into HFS scenarios with the objective of maintaining skill
competency. Additionally, the concept of skill performance is part of the outcomes section for the NLN/Jeffries simulation framework. Consistent skill practice, based on the concept of deliberate practice, should occur prior to HFS scenarios to allow the students to develop skill acquisition and meet the outcome goal of competent skill performance. This change would promote the bridging of theory and practice leading to competent performance in the clinical setting.

Recommendations for Nursing Education and Practice

The results of this study support the need for the incorporation of consistent skill practice in nursing education. The acquisition of skill competency and retention cannot be obtained after a one-time skill education and assessment. The use of deliberate practice for the skills representative to nursing to achieve competency in nursing graduates is essential to patient safety and quality care (DeBourgh, 2011; Gonzales & Sole, 2014; Jeffries et al., 2011; Oermann et al., 2011). Therefore, this researcher calls for a new paradigm view of skill acquisition and mastery in nursing education. The essential steps in this process are depicted in Figure 4:
To adopt this new paradigm of skill education, pre-licensure nursing education programs must incorporate peer-to-peer deliberate practice of skills into the curriculum for students to be able to refine and develop competency. Only after this step, should the skills be incorporated into HFS scenarios so students can apply what has been learned in a fast paced, contextual, learning environment. Once this practice has been completed, then the student can perform the skill in a clinical environment with confidence and competence.

Recommendations for Future Research

Recommendations for future research include using the methods and steps in this pilot study in a larger sample size. Additionally, research needs to be completed on the inclusion of all the essential steps in skill acquisition and retention to graduate nurses competent in the representation skills of nursing. Certain representative tasks of nursing involving the use of sterile techniques are critical for patient safety and nursing education should focus on skill competency for these tasks. These tasks include sterile dressing changes, urinary catheter insertion, central line use and dressing changes. Additionally,
these tasks are found in the National Database of Nursing Quality Indicators and are
directly linked to patient outcomes (Montalvo, 2007). However, these tasks are just part
of nursing-sensitive outcomes which link the value of nurses in providing quality, safe
patient care (Montalvo, 2007). It is imperative that new nurses graduate with knowledge,
skills, and critical thinking necessary to provide patient care in the complex healthcare
system. Competent nursing care is the key to safe patient practices to reduce skill-based
efforts and the risk of adverse events such as a hospital-acquired infections from invasive

Limitations

Limitations of the study included the use of convenience sampling, a small
sample size, and the use of a single site. The use of non-probability, convenience
sampling is common in nursing studies (Polit & Beck, 2012). The major limitation with
convenience sampling is the possibility the sample is not representative of the targeted
population (Polit & Beck, 2012). However, this was a pilot study, and methodological
decisions such as convenience sampling, sample size, and the use of a single site were
based on practical constraints such as access to participants, time, and resources. The
study provided insight into optimal approaches to testing educational interventions
focused on deliberate practice and the potential impact of deliberate practice on skills
acquisition and retention.

Conclusions

The need for the transformation of nursing education with non-traditional
innovative pedagogies has been identified by multiple leading organizations (American
Association of College of Nursing, 2015; National League of Nursing, 2005; Agency for Healthcare Research and Quality, 2013). Skill competency is an essential outcome of nursing education. Therefore, nursing programs have an obligation to graduate nursing students competent in the psychomotor skills inherent in nursing to provide quality, safe patient care

This pilot study was an important assessment of the process of skill acquisition and retention in pre-licensure nursing students. The study incorporated the research in several other fields related to learning psychomotor skills and the importance of deliberate, consistent practice over time. The data from this study provides a strong underpinning for future studies in nursing education to address how students’ best learn and retain mastery of skills. The tradition in nursing education of a one-time education and assessment is not working and cannot continue. The essential steps to skill acquisition and retention provides the framework needed for a new paradigm in nursing education focused on learning and integrating skills into the curriculum.
REFERENCES

Ackermann, A. D. (2009). Investigation of learning outcomes for the acquisition and retention of CPR knowledge and skills learned with the use of high-fidelity simulation. *Clinical Simulation in Nursing, 5*, e213-e222. doi:10.1016/j.ecns.2009.05.002


Howard, V. M. (2013). President’s message. *Clinical Simulation in Nursing, 9*, S2. doi:http://dx.doi.org/10.1016/j.ecns.2013.05.010


APPENDIX A
DEMOGRAPHIC FORM
# Demographic Form

<table>
<thead>
<tr>
<th></th>
<th>1&lt;sup&gt;st&lt;/sup&gt; degree (traditional student)</th>
<th>Second degree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ID#</strong></td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
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<tbody>
<tr>
<td><strong>Gender:</strong></td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Black</th>
<th>Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race:</strong> (Check all that apply)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>American</td>
<td></td>
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<tr>
<td>Multi-Racial Islander</td>
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</table>

<table>
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<tr>
<th></th>
<th>Non-Hispanic</th>
<th>Hispanic</th>
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</thead>
<tbody>
<tr>
<td><strong>Ethnicity:</strong></td>
<td></td>
<td></td>
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</tbody>
</table>

Have you worked or are currently working as a nursing technician or assistant?  
□ Yes  □ No

Please indicate how confident you are in your ability to perform nursing skills by circling a number below:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</table>

Please indicate how important you feel practice is to learning and being able to perform a nursing skill by circling a number below:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</tbody>
</table>
Urinary Catheter Insertion Competency Measurement Checklist

<table>
<thead>
<tr>
<th>STEPS</th>
<th>Completed (2 points)</th>
<th>Completed but not in correct order (1 point)</th>
<th>Not completed/Omitted/Not performed correctly (0 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Perform hand hygiene and don clean gloves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Open outer packaging, remove tray and open CSR wrap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Position patient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Place underpad beneath patient, plastic or “shiny” side down</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5. Use provided castile soap wipes to cleanse patient’s peri-urethral area using downward strokes from anterior to posterior</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Discard gloves. Perform hand hygiene with provided alcohol hand sanitizer gel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Maintain aseptic technique and don sterile gloves</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8. Use the syringe with the green plunger to deposit lubricant into tray-top for catheter lubrication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Remove top tray and place next to bottom tray (keep on CSR wrap)</td>
<td></td>
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<tr>
<td>10. Attach the water-filled syringe to the inflation port</td>
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<td></td>
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<tr>
<td>Note: It is not necessary to pre-test the Foley catheter balloon</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>11. Remove Foley catheter from wrap and lubricate catheter</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12. Prepare patient with packet of pre-saturated antiseptic swab sticks: Female Patient: with a downward stroke cleanse the right labia minora and discard the swab. Repeat for left labia minora. Use the last swab stick cleanse the area between the labia minora.</td>
<td></td>
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<tr>
<td>13. Proceed with catheterization until urine is visible in the drainage tube. Advance catheter two more inches.</td>
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<tr>
<td>14.</td>
<td>Inflate catheter balloon using entire 10mL of sterile water provided in the prefilled syringe</td>
<td></td>
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</tr>
<tr>
<td>15.</td>
<td>Once the balloon is inflated, ease the catheter back by gently pulling on the catheter until slight tension is detected indicating that the balloon is in place at the neck of the bladder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>After inserting the catheter, discard all materials in accordance with the hospital protocol and remove contaminated gloves</td>
<td></td>
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</tr>
<tr>
<td>17.</td>
<td>Properly secure indwelling catheter after insertion to prevent movement and urethral traction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Position hanger on bed rail at the foot of the bed and use green sheeting clip to secure drainage tube to sheet, confirm tube is not kinked</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total of each column

Total Assessment score

Adapted from the Centers for Disease Control and Prevention (CDC) healthcare infection control practices advisory committee guidelines and AHRQ’s national *On the CUSP: Stop CAUTI* project resources.
Interview Guide

1. Keeping in mind the peer-to-peer practice at the beginning of each simulation session, how did this affect your learning?
   a. Prompt: Tell me more about your experience when practicing with peers

2. Keeping in mind your group inserted a foley catheter during every simulation scenario, tell me how did this experience affect your learning?
   a. Prompt: Tell me more about how learning during simulation was different from practice.

3. Looking back at the beginning of fall semester, you completed the first foley catheter insertion checkoff after learning the skill in your junior year. Can you tell me about your experience in your first checkoff?

4. Looking back at the second checkoff, which occurred at the end of fall semester, after practicing the skill all semester, how was that experience for you?

5. Looking back at the third checkoff, which occurred after winter break, how was that experience for you?

6. Looking back at the other groups which were different (one didn’t insert foley catheters any, and the other only during simulation scenarios), how do you feel your learning was affected?

7. Is there anything else about this experience you would like to add?

Additional question added after first two interviews were completed:

1. Tell me how you feel you learn best based on your individual learning style?
APPENDIX D

SIMULATION LAB CONFIDENTIALITY AND AUDIO-VISUAL RECORDING AGREEMENT
Simulation Lab Confidentiality and Audio-Visual Recording Agreement

Name: ____________________________________________

CONFIDENTIALITY OF INFORMATION
In order to preserve the realism of simulation scenarios and to provide an equitable learning experience for all participants, this confidentiality agreement applies to the simulation itself as well as all information made available to you during the scenario.

During participation in simulation you may witness the performance of other individuals managing clinical events during real time scenarios as well as in debriefing videos. Due to the unique aspects of this form of training, you are asked to maintain and hold confidential all information regarding the performance of specific individuals and the details of specific scenarios.

By signing below, you acknowledge to having read and understood this statement and agree to maintain the strictest confidentiality about any observations you may make regarding the scenario content. You are also agreeing to protect the privacy and confidentiality of all participants and their performance while in the simulation lab.

AUDIOVISUAL DIGITAL RECORDING
There is audiovisual digital recording capability in the SimLab. In some situations you may view these recordings with other individuals who are participants in your simulation experience as part of the debriefing after an assessment. These recordings may be made available to the nursing faculty and dean of nursing as needed. These recordings are the property of Berry College, and will not be shared with others without express written legal permission.

ATTESTATION
I am aware that there will be continuous audiovisual digital recording while I am participating in simulation. I understand that the recordings will be shown during debriefing, for educational and/or administrative purposes, and will be reviewed by SimLab staff to improve simulation and/or critique participant performances.

I also agree to hold confidential all information, video and scenario content to which I am exposed during the simulation event. I agree to protect the privacy and confidentiality of all participants and educators involved in simulation.

My signature below confirms I have read all of the above and agree to the terms under Confidentiality of Information and Audiovisual Digital Recording.

__________________________________________  __________
Signature of Student                       Date
Interview Guide Two

1. Keeping in mind the different skill review and peer-to-peer practice at the beginning of each simulation session, how did this affect your learning?

   a. Prompt: Tell me more about your experience when practicing with peers

2. Tell me how practicing different skills in peer-to-peer practice prior to each simulation session affected your ability to insert foley catheters?

3. Tell me more about how learning during simulation was different from practice.

4. Looking back at the other groups which were different (one didn't insert foley catheters any, and the other practiced every simulation day prior to scenarios), how do you feel your learning was affected?

5. Tell me how you feel you learn best based on your individual learning style?

6. Describe for me the best way for you to learn skills during nursing school?

7. Is there anything else about this experience you would like to add?
APPENDIX F

MERCER UNIVERSITY INSTITUTIONAL REVIEW BOARD
APPLICATION APPROVAL LETTER
Dear Ms. Johnson:

Your application entitled: The effect of deliberate practice combined with high-fidelity simulation scenarios on psychomotor skill competency and retention in prelicensure nursing education: A mixed methods pilot study (H1506188)

RE: The effect of deliberate practice combined with high-fidelity simulation scenarios on psychomotor skill competency and retention in prelicensure nursing education: A mixed methods pilot study (H1506188)

Dear Ms. Johnson:

Your application entitled: The effect of deliberate practice combined with high-fidelity simulation scenarios on psychomotor skill competency and retention in prelicensure nursing education: A mixed methods pilot study (H1506188), was reviewed on behalf of Mercer University's Institutional Review Board for Human Subject Research, and is Exempt from further review at this time, in accordance to federal regulations set forth at 46 CFR 101(1) Category(ies) 1.

Any changes to the approved protocol must be re-submitted for IRB review to insure that risks to the subject have not changed.

Respectfully,

[Signature]

Ava Chambliss-Richardson, M.Ed., CIM, CIP
Member
Institutional Review Board