PURPOSEFUL SIMULATION ROLE ASSIGNMENT

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by
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ABSTRACT

In order to efficiently use simulation resources, nursing students are often assigned various simulation roles. A double-blind, randomized control trial was conducted to explore the impact of purposeful simulation role assignment, using preferred learning styles, on prelicensure nursing students' clinical reasoning. A convenience sample of pre-licensure nursing students from a mid-western college of nursing were assigned with either the experimental or control group. Participants in the experimental group were assigned simulation roles that were congruent with their preferred learning style. Participants in the control group were assigned simulation roles that were not congruent with their preferred learning styles. The participants' preferred learning styles were determined using the Index of Learning Styles. Clinical reasoning was measured before and after a simulation experience using the Nurses Clinical Reasoning Scale. Data were analyzed using *t* tests. When post intervention scores were compared to pre-intervention scores, both the experimental and control groups had a statistically significant increase in clinical reasoning scores.

APPROVAL PAGE

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DEDICATION

To my husband, Jeff, without your love and support I would have not been able to embark on this journey. To my children, Jacob and Matthew, I hope watching me on this journey helps you know you can do anything when you set your mind to it and work hard.

CHAPTER 1

INTRODUCTION

The shift in healthcare from the inpatient to outpatient setting is putting a strain on clinical sites for nursing students. In 2011, the Institute of Medicine published *The Future of Nursing: Leading Change, Advancing Health* report which called for a change in nursing education. Simulation can be used as an adjunct to traditional clinical experiences thereby reducing the strain on clinical sites (Institute of Medicine, 2011). Simulation provides a safe learning environment for students to increase their knowledge, confidence, and critical thinking skills (Bambini, Washburn, & Perkins, 2009; Cardoza & Hood, 2012; Hart et al., 2014; Schoessler et al., 2012).

Simulation use is widely accepted in the United States as an adjunct to traditional clinical experiences in prelicensure nursing programs. The National Council of State Boards of Nursing surveyed all prelicensure nursing programs in the United States regarding simulation use and received a 62% response rate (Gore, Van Gele, Ravert, & Mabire, 2012). Of the responding programs, 87% indicated they used simulation with 54% indicating simulation was used in at least five clinical courses. In addition, 69% of the responding programs identified simulation was regularly substituted for clinical hours (Gore et al., 2012).

A national simulation research study was conducted from 2011 to 2013 with the purpose of providing the state boards of nursing with evidence related to the effectiveness of simulation on nursing students' knowledge, clinical competency, and first-time National Council Licensure Examination (NCLEX) success (Hayden, Smiley, Alexander, Kardong-

Edgren, & Jeffries, 2014). The study had three groups: a control group that had no more than 10% of their clinical time replaced with simulation and two groups that had 25% or 50% of their clinical time replaced with simulation. The results of the study found there were no statistically significant differences between the three groups on nursing knowledge, clinical competency, and first-time NCLEX success. These results supported replacing up to 50% of clinical time with simulation (Hayden et al., 2014).

Incorporating simulation into the curriculum requires a large amount of resources. Some of these resources include space, equipment, and faculty who have received education regarding the use of simulation (Al-Ghareeb & Cooper, 2016; INACSL, 2017; Ray, 2017). Simulators alone can be quite costly with one simulator costing anywhere from \$30,000 to \$100,000. In order to maximize the use of these resources, several students may participate in one simulation experience. This creates the need to assign students to various roles. There is currently no research related to the best methods to assign simulation roles. However, there is research that suggests some students prefer the direct care provider roles while others prefer the observer roles (Harder, Ross, & Paul, 2013; Hober & Bonnel, 2014; Stegmann, Pilz, Siebeck, & Fischer, 2012). Student feedback related to their perceptions of the observer and direct care provider roles in simulation points to differences in learning style (Hober & Bonnel, 2014). Assigning simulation roles based on learning styles may promote student learning during simulation; however, no research exists related to this topic.

Purpose of the Study

The purpose of the study was to explore how purposeful simulation role assignment, based on student preferred learning style, impacts nursing students' clinical reasoning skills.

All nurses must possess clinical reasoning skills to be able to identify changes in a patient's condition and respond appropriately (Lee, Lee, Bae, & Seo, 2016; Levett-Jones et al., 2010). A nurse with poor clinical reasoning skills may fail to recognize a change in patient condition resulting in failure to rescue (Levett-Jones et al., 2010). Enhancing nursing students' clinical reasoning skills may improve their ability to recognize a deteriorating patient and therefore improve patient outcomes.

Rationale of the Study

Kavanagh and Szweda (2017) reviewed the results of the Performance Based Development System, a reliable and valid competency assessment system, and identified that 76-80% of more than 5,000 inexperienced nurses do not meet the clinical reasoning expectations for new nurses. No differences were found based on the new nurses' level of education (Kavanagh & Szweda, 2017). Kavanagh and Szweda identified a potential cause for this lack of clinical reasoning as a focus on teaching tasks not the application of knowledge to clinical practice. Difficulty in obtaining adequate clinical sites may also be a contributing factor. Simulation can provide an adjunct to traditional clinical experiences and allow nursing students the ability to practice clinical reasoning skills in a safe environment.

According to Whitman and Backes (2014) and Harder, Ross, and Paul (2013), it is important to assign students clear roles in simulation. They noted an increase in student satisfaction and engagement during a simulation when clear directions related to role assignment were given. This increased engagement led to students not missing important learning points (Harder et al., 2013; Whitman & Backes, 2014). Research by Harder et al. (2013) and Hober and Bonnel (2014) identified that some students preferred the observer role

as it allowed them to watch their peers and view the simulation from a broader view. Other students stated they preferred a direct care provider role and quickly became bored with the observer role (Harder et al., 2013). These comments suggest differences in preferred learning style may influence learning during simulation.

Significance of the Study

As simulation use continues to grow, nurse educators need to know how to promote learning in simulation for both direct care providers and observers. The majority of simulation research has focused on the outcomes of the direct care providers during simulation (Bambini et al., 2009; Cardoza & Hood, 2012; Hart et al., 2014; Schoessler et al., 2012; Secomb, McKenna, & Smith, 2012). There is evidence to suggest that students who observe simulation are able to achieve the same learning outcomes as those who are direct care providers (Collins, Lambert, Helms, & Minichiello, 2017; Howard, 2017; Scherer, Foltz-Ramos, Fabry, & Chao, 2016; Zulkosky, White, Price, & Pretz, 2016). Further research is needed to determine how to best promote learning for the observer in simulation. Research suggests students are better able to meet learning outcomes when teaching strategies are congruent with students preferred learning styles (Marek, 2013; Robertson, Smellie, Wilson, & Cox, 2011; Vizeshfar & Torabizadeh, 2018). Learning styles may provide a way to assign simulation roles to promote learning. This research study adds to the body of knowledge related to learning styles as well as simulation role assignment. This research study also has the potential to change how simulation roles are assigned.

Overview of the Study

The study used a double-blind, randomized control trial design to explore how assigning simulation roles using learning styles influences nursing students' clinical reasoning skills. The Clinical Reasoning Model and the Felder-Silverman Learning Style Model were used to guide the proposed study. The proposed study had one research question and hypothesis.

Research Question: What is the impact of purposeful simulation role assignment, based on students' preferred learning style, on nursing students' clinical reasoning skills?

Hypothesis: Assigning simulation roles based on students' preferred learning style will improve nursing students' clinical reasoning skills.

Definition of Terms

There are five terms that provide meaning to the study. These terms are simulation, clinical reasoning, learning style, direct care provider, and observer. The definitions of these terms are listed below.

Simulation

Simulation is an activity that replicates the clinical environment and is designed to foster skill development and clinical reasoning. The activity is focused on the student, with the instructor providing a supportive role. A simulation is followed by a debriefing which allows the students to reflect on the experience (Jeffries, 2005).

Clinical Reasoning

Clinical reasoning is the process nurses use to make clinical decisions (Tanner, 2006).

Learning Style

A student's learning style is the manner in which the student processes and understands new information (Bhattacharyya & Shariff, 2014).

Direct Care Provider Role

This researcher defines this role as the individual who is providing direct patient care during the simulation experience. This individual is responsible for the assessment of the patient, completion of interventions, and communication with other members of the healthcare team.

Observer Role

This researcher defines this role as the individual who silently observes the simulation experience. This individual reflects on the care that is provided during the simulation experience.

Conclusion

An increase in outpatient healthcare is making it more difficult for nursing faculty to find inpatient clinical sites to meet nursing students' educational needs. Using simulation to augment traditional clinical experiences is becoming more common. Students are often assigned various simulation roles; however, there is currently no research related to the best methods to assign these roles. Identifying students' preferred learning styles provides one method for assigning simulation roles. This study explored how assigning simulation roles based on students' preferred learning style impacts nursing students' clinical reasoning skills. This study adds to the body of knowledge related to simulation role assignment. In addition,

this study provides faculty with information regarding one method for assigning simulation roles.

CHAPTER 2

REVIEW OF LITERATURE

As nursing programs increase the use of simulation as an adjunct to traditional clinical experiences, simulation research is also increasing. The trend in simulation research is moving from the outcomes of knowledge acquisition and skill development to clinical reasoning and decision-making (Foronda, Liu, & Bauman, 2013; Lapkin, Levett-Jones, Bellchambers, & Fernandez, 2010). Research related to learning styles has focused on identifying students' preferred learning styles rather than correlating learning styles with various teaching strategies (Blevins, 2014; Pettigrew, Dienger, & O'Brien King, 2011; Prithishkumar & Michael, 2014). This chapter will discuss the current simulation literature related to the themes of knowledge acquisition, skill development, and clinical reasoning. In addition, the current literature related to learning styles will be discussed.

Simulation Research

As nursing programs increase the use of simulation as an adjunct to practice, simulation research has also increased. The trend in simulation research has moved from the outcomes of knowledge acquisition and skill development to clinical reasoning and decision-making. Despite the increase in simulation research, no research was found that explored methods of assigning simulation roles. The next sections will discuss the current simulation literature related to the themes of knowledge acquisition, skill development, clinical reasoning, and role assignment.

Knowledge Acquisition and Skill Development

Early simulation research focused on the acquisition of knowledge and skill development (Foronda et al., 2013; Lapkin et al., 2010). Evidence supports the use of simulation to increase student knowledge as well as improve clinical skills (Brannan, White, & Bezanson, 2008; Foronda et al., 2013; Gates, Parr, & Huguen, 2012). The acquisition of knowledge can be attributed to applying new knowledge to a patient scenario. Simulation also provides an opportunity to practice various nursing skills.

Brannan, White, and Bezanson (2008) conducted a study to compare student knowledge gained using traditional lecture versus simulation. Junior level baccalaureate nursing students enrolled in an adult health course were recruited to participate in the study. Data collection occurred over two semesters; fall and spring. Participants enrolled in the fall course (n = 53) received instruction regarding acute myocardial infarction using traditional lecture. Participants enrolled in the spring course (n = 54) received instruction regarding acute myocardial infarction using simulation without a lecture component. Knowledge for both groups was measured before and after the instruction using a researcher developed knowledge test. Participants who completed the simulation had statistically significant higher posttest knowledge scores than those who received traditional lecture (Brannan et al., 2008). The results of this study supported the use of simulation as a teaching strategy to increase knowledge in nursing students.

Schlairet and Pollock (2010) conducted a study to compare nursing student knowledge gained in a simulated clinical environment versus the traditional clinical experience. The participants (n = 74) were nursing students enrolled in a fundamentals

nursing course. The participants were randomized to one of two groups. One group completed two weeks of traditional clinical experiences followed by two weeks of simulation. The second group completed the simulation during the first two weeks followed by traditional clinical experiences. The participants completed a knowledge test at the beginning of the study, after the first two weeks, and after the second two weeks. The results indicated that both groups had statistically significant knowledge gains on both post-tests; however, there was not a statistically significant difference between the groups (Schlairet & Pollock, 2010). The results suggested that simulation can provide a learning environment that is as effective as the traditional clinical environment in increasing knowledge.

Gates, Parr, and Huguen (2012) conducted a study with the purpose to examine the knowledge gains in undergraduate nursing students after participating in a simulation experience. The sample consisted of 104 nursing students enrolled in their first medical-surgical nursing course. Participants were randomly assigned to participate in either a pulmonary embolism ($n = 53$) or gastrointestinal bleed ($n = 51$) simulation. These simulations were chosen as they had been successfully used in previous semesters. In addition, these disease processes were both discussed in the course prior to the simulation. Knowledge acquisition was measured using two researcher developed examinations; one for pulmonary embolism (PE) and one for gastrointestinal (GI) bleed. All participants completed both examinations. Therefore, the participants in the PE group served as the control group for the GI bleed group. Likewise, the participants in the GI bleed group served as the control group for the PE group. The results identified that participating in the pulmonary embolism simulation will, on average, raise an individual's exam score by 8.1%. Participating in the

gastrointestinal bleed simulation will, on average, raise an individual's exam score by 8.6% (Gates et al., 2012). This was significant as a grade increase of 8% is almost one full letter grade on a traditional grading scale.

Scherer, Foltz-Ramos, Fabry, and Chao (2016) conducted a study with the purpose to compare the effectiveness of two types of simulation on nursing students' knowledge acquisition. The participants (n = 80) were baccalaureate nursing students enrolled in a basic nursing therapeutics course. The first group (n = 40) completed an asthma exacerbation simulation followed by a debriefing. Immediately after the debriefing, they repeated the same simulation. The second group (n = 40) was assigned roles of direct care provider or observer and completed the same asthma exacerbation scenario and debriefing. Immediately after the debriefing, the participants switched roles and completed the same simulation. The participants completed a researcher developed knowledge test prior to the first simulation, after the first simulation, and after the second simulation. The results of the study indicated an overall statistically significant increase in knowledge scores after completion of the simulation experiences. However, when comparing knowledge scores after the first and second simulations the increase was not statistically significant. In addition, when comparing the scores between the groups, there was not a statistically significant difference. When comparing the simulation roles, those who observed the simulation first had statistically significant higher posttest knowledge scores than those who participated first (Scherer et al., 2016). The results of this study supported the use of simulation to increase knowledge. The results also identified that those who observe simulation experiences have an increase in knowledge that was comparable to the direct care providers.

Eyikara and Baykara (2018) conducted a study aimed to determine the effect of simulation on nursing students' ability to accurately obtain vital signs. The sample consisted of 90 first year nursing students. The participants were evaluated on their ability to obtain vital signs as well as their knowledge of how to obtain vital signs. Participants were randomly assigned to one of three groups; a control group and two experimental groups. All three groups were taught how to take vital signs using traditional lecture methods. After the traditional lecture, the participants' knowledge was measured using a researcher developed test. The control group then attended a laboratory session where a faculty member observed them obtaining each other's vials signs and provided feedback. Experimental group one attended a simulation session where they measured a simulator's vital signs while a faculty member observed and provided feedback. Experimental group two attended both the simulation and laboratory session as previously described. After the educational sessions, the participants completed a knowledge post-test as well as obtained vital signs in both healthy and ill adults. The study results identified both experimental groups had statistically significant higher scores on the knowledge post-test than the control group. There was not a significant difference in knowledge post-test scores between the two experimental groups. The ability to accurately obtain vital signs was measured using a researcher developed vital signs control list (VSCL). The results of the VSCL identified both experimental groups had statistically significant higher scores than the control group. The only statistically significant difference between the two experimental groups was related to blood pressure. Experimental group two had statistically significant higher scores for blood pressure in healthy adults than

experimental group one (Eyikara & Baykara, 2018). The results of this study supported the use of simulation as a method for teaching students skills such as vital signs.

Clinical Reasoning

Recent simulation research has explored higher level outcome measures such as clinical reasoning. Gibbs, Trotta, and Overbeck (2014) conducted a study to compare the effect of a hypoglycemia case study versus a hypoglycemia simulation on nursing students' knowledge and clinical reasoning. The sample consisted of 96 first year associate degree nursing students. Both groups received a three-hour lecture on diabetes and watched a 30-minute video related to complications of diabetes. After this education, the participants either participated in a hypoglycemia simulation or completed a hypoglycemia case study. The simulation and case study were both completed in groups of five. A knowledge test related to hypoglycemia was given prior to the case study/simulation as well as afterwards. In addition, an objective clinical evaluation tool was completed by faculty to measure clinical decision making. Both groups had statistically significant higher scores on the knowledge test after the case study/simulation. The simulation group had a statistically significant higher score on the clinical evaluation tool (Gibbs, Trotta, & Overbeck, 2014). The results of this study supported the use of simulation to increase knowledge and clinical reasoning skills in nursing students.

Lee and associates (2016) conducted a study to explore the effects of simulation on nursing students' clinical reasoning. The participants (n = 49) were nursing students enrolled in either a clinical reasoning or a critical patient course. The experimental group consisted of those enrolled in the clinical reasoning course which was a simulation-based course focused

on providing care using the nursing process. The control group consisted of those enrolled in the critical patient course which was a traditional lecture course focused on critical care based on the body systems. Clinical reasoning was measured using a problem-solving skills self-report tool. The experimental group showed a larger increase in clinical reasoning scores than the control group; however, the difference was not statistically significant (Lee, Lee, Lee, & Bae, 2016). The results of this study supported the use of simulation to increase nursing students' clinical reasoning ability.

Zulkosky, White, Price, and Pretz (2016) conducted a research study with the purpose of assessing the clinical-decision making accuracy of fourth semester associate degree nursing students when assigned various simulation roles. The participants were randomly assigned to the simulation role of primary nurse, auxiliary nurse, family member, or observers. The results indicated that overall clinical decision-making accuracy was higher among those in the primary nurse and observer roles (Zulkosky et al., 2016). The results of this study supported the use of simulation to increase clinical reasoning for direct care providers as well as observers. It also supported the need for further research to evaluate student learning in various simulation roles.

Alamrani, Allammar, Alqahtani, and Salem (2018) conducted a study to compare the effect of simulation versus traditional lecture on nursing students' clinical reasoning. The sample consisted of 30 baccalaureate nursing students who were randomly assigned to a control or intervention group. Clinical reasoning was measured before and after the instructional method using a researcher developed tool. The control group received traditional lecture regarding basic concepts of electrocardiograms (ECGs) including

identification of basic arrhythmias. The intervention group completed six simulation experiences related to the same content. Both groups had a statistically significant increase in clinical reasoning scores. The difference in the clinical reasoning scores between the groups was not statistically significant (Alamrani, Alammam, Alqahtani, & Salem, 2018). The results of the study supported the use of simulation as being as effective as traditional methods in supporting clinical reasoning in students. The content of the education was electrocardiogram interpretation which does not require the same level of clinical reasoning as providing care to a patient requires. This, as well as the small sample size, could have impacted the results.

Simulation Role Assignment

Research related to role assignment focuses on student perceptions of the experience and lower level outcomes such as knowledge acquisition (Harder et al., 2013; Hober & Bonnel, 2014; Howard, 2017; Stegmann et al., 2012). Stegmann, Pilz, Siebeck, and Fischer (2012) conducted a study with the purpose of determining the effectiveness of observing a simulation compared to hands-on simulation completion on knowledge acquisition. The participants ($n = 200$) were medical students who completed a simulation consisting of obtaining a health history and completing a physical examination. The participants completed the simulation in pairs with one participant performing and the other observing. On the following day, the participants changed roles to complete a similar simulation. In addition, approximately half of the participants ($n = 106$) were provided an observation script to use while watching the simulation. Knowledge was measured prior to the first and second simulations as well as the day after the second simulation. The results of the knowledge test indicated that observational learning was more effective than hands-on learning, especially

when supported by an observation checklist (Stegmann et al., 2012). While this study supported the use of simulation observation to increase knowledge, it did not explore if the participants were able to apply the information learned.

Harder, Ross, and Paul (2013) conducted a study with the purpose to explore nursing student perceptions of role assignment in simulation. The study followed a focused ethnography approach where data was collected by the researchers through observing the participants, faculty, and simulation technicians in the simulation environment. In addition, individual interviews were conducted within one week of the simulation experience. The participants (n = 84) were third year baccalaureate nursing students who were beginning their medical-surgical clinical experiences. The method for simulation role assignment varied based on the preference of the clinical faculty. While most assigned roles at the start of the simulation, some allowed the participants to determine their own simulation roles. The roles used during the simulation experiences were primary nurse, secondary nurse, other nurse, documentation nurse, communication nurse, observation nurse, and family member. Some of the students expressed satisfaction with being assigned less active roles such as the observer and documentation nurse. One student in the documentation nurse role stated “You’re watching your peers do something so you’re thinking about how you would maybe do something differently. And you get the bigger picture sometimes” (Harder et al., 2013, p. e331). Other participants identified that they learned better by observing others instead of having an active role. On the other hand, some of the participants found the observer role to be “boring” (p. e332) and preferred to be assigned active roles (Harder et al., 2013). The

results of this study suggested some students may be better matched to the observer role than others.

Hober and Bonnel (2014) conducted a study with the purpose to explore baccalaureate nursing students' perceptions of the observer role in simulation. Data were collected using interviews and a qualitative survey. Participants (n = 50) were senior level baccalaureate nursing students and were randomly assigned to the role of observer (n = 23) and primary and/or secondary nurse (n = 27). The results identified that participants felt the observer role was a valuable simulation role that helped them learn. Participants identified that while observing they could focus on learning without the pressure to perform. Participants also identified that the observer role allowed them to view the simulation experience from a broader view and think about what they would have done during the simulation. In addition, the participants described how they were able to use clinical reasoning while in the observer role. They described identifying key pieces of information, interpreting that information, and using it to evaluate the actions of their peers (Hober & Bonnel, 2014). The results of this study suggested students are able to use clinical reasoning skills while observing simulation experiences.

Zulkosky, White, Price, and Pretz (2016) conducted a study with the purpose to compare clinical decision making accuracy between nursing students in different simulation roles. The participants were fourth semester nursing students in an associate degree program. Simulation roles were randomly assigned and included primary nurse, medication nurse, education nurse, family member, and observer. The results of this study identified no significant difference in clinical decision making accuracy when the simulation scenario

included familiar content. When the content was unfamiliar, the observers were more accurate in their decision making than the primary nurses; however, this difference was not statistically significant. The observers were significantly more accurate in their decision making than the family members (Zulkosky et al., 2016). The results of this study supported the use of simulation observation to increase clinical reasoning skills.

Howard (2017) conducted a mixed methods study with a purpose to compare the satisfaction, self-confidence, and engagement among nursing students in traditional observer versus defined observer roles in simulation. The participants (n = 132) were first-year baccalaureate nursing students. The control group (n = 65) consisted of participants who were assigned traditional observer roles which had no defined responsibilities. The experimental group (n = 67) consisted of participants who were assigned defined observer roles which had specific responsibilities during the simulation and debriefing. Participants completed a qualitative questionnaire as well as three quantitative tools. Overall, some of the participants expressed satisfaction and learning with the observer role. This is indicated by the student comments such as “I was able pay attention to the small details of the overall simulation and that helped me understand more” (Howard, 2017, p. 84). Another student stated “I was able to see the things we talked about in class and things seemed to click” (Howard, 2017, p. 81). On the other hand, some students indicated they would have preferred hands-on learning with statements such as, “I’m not as satisfied with just being an observer, I would rather be hands on to learn what needs to be done” (Howard, 2017, p. 78). In addition, students indicated a preference for the defined observer role. Students in this role indicated they were engaged and focused during the simulation. Students in the traditional observer

role indicated they felt awkward and unsure of what to do while observing the simulation. The quantitative results supported these findings as the defined observers had statistically significant higher scores for satisfaction, self-confidence, and engagement than the traditional observers (Howard, 2017). The results of this study suggested learning styles may influence learning that occurs in various simulation roles. The results also supported the need to have clearly defined responsibilities for simulation observers.

Learning Styles Research

Research related to learning styles has focused on identifying student learning styles. Little research exists that evaluates the effectiveness of teaching strategies for specific learning styles (Blevins, 2014; Hallin, 2014; Pettigrew, Dienger, & O'Brien King, 2011; Prithishkumar & Michael, 2014). Studies are difficult to compare as they differ in which learning styles are identified.

Meehan-Andrews (2009) conducted a study to determine the learning styles of first year health science students as well as student satisfaction related to various teaching strategies. They used the Visual, Aural, Read/Write, Kinesthetic (VARK) questionnaire to determine the participants' learning styles. The results of the study indicated the majority (68%) of participants preferred to use one mode of learning, the kinesthetic mode. The next common preferences were to use two methods of learning, either read/write and kinesthetic (26%) or visual and kinesthetic (23%). When looking at all participants (uni-modal and multi-modal), 77.9% preferred the kinesthetic mode of learning. The results of the study also indicated that the great majority of participants (91.9%) perceived practical (laboratory) classes to be the most beneficial to learning by helping the participants understand the lecture

material (Meehan-Andrews, 2009). While this study did not correlate participant learning styles directly with teaching strategies, the results suggested that even participants without a kinesthetic preference benefited from hands-on practical classes. This may be attributed to the visual aspects of the practical classes (such as viewing models) appealing to the visual learners.

AlKhasawneh (2013) conducted a study to determine the learning styles of nursing students at various academic levels. A total of 197 nursing students participated in the study. Twenty-six of the participants were first year nursing students, 19 were second year, and 152 were third year nursing students. The VARK questionnaire was used to determine the participants' learning styles. The results of the data analysis indicated that 45% of the participants had a single learning preference while 55% had a multimodal preference. Detailed information regarding the learning preferences for those with a single learning preference was not provided. For those with a multimodal preference, 60% indicated a kinesthetic preference accompanied with another preference. The preferred learning styles differed based on the participants' level in the nursing program. First year students had a higher preference for visual learning than the other levels. Second year students had a higher preference for read/write learning than the other levels and third year students had a higher preference for kinesthetic learning. The results of this study identified that an individual's learning style can change over time; therefore, it is important to reassess students' learning preferences throughout the curriculum (AlKhasawneh, 2013).

Marek (2013) conducted a study to evaluate the impact of faculty mentoring on learning style specific study habits. The study compared the study habits of associate degree

nursing students who completed the VARK learning assessment tool (control group) with those who completed the VARK tool and participated in faculty mentoring related to learning style specific study habits (experimental group). Each participant indicated the VARK assessment assisted them with understanding how they learn (Marek, 2013). Marek (2013) determined that 100% of the experimental group changed their study habits compared to 77% of the control group. The results of this study suggested faculty should assist students in identifying their learning styles and provide them with learning style specific information. This can assist the students in adjusting their study habits to align with their preferred learning style (Marek, 2013).

Hallin (2014) conducted a study with the purpose to explore learning style preferences of nursing students in their final semester of nursing school. The study was conducted on two campuses of a single institution. Hallin used the Productivity Environmental Preference Survey (PEPS) to determine the participants' learning style preferences. The PEPS was completed by 263 students with 125 being from campus A and 138 being from campus B. The PEPS measures four areas of learning preferences: environmental, emotional, sociological, and physiological. While most subscale scores indicated the students did not have a strong preference, some preferences were identified. The majority of the participants indicated a strong preference for structure in the learning environment (74.1%) and working with their peers (66.9%). Sensory preferences were also identified with 31.9% preferring auditory learning, 30.8% preferring tactile learning, and 27.7% preferring kinesthetic learning. Only 8% preferred visual learning. One significant difference was noted between the two campuses. Students at campus B had a higher

preference for tactile learning than those at campus A ($p = .004$) (Hallin, 2014). While this study identified the learning preferences of nursing students, it did not explore how learning style preferences influence learning.

Simulation and Learning Styles Research

Some research exists that explores the relationship between learning styles and learning that occurs during simulation. This research focuses on identifying which students achieved better learning outcomes during simulation experiences based on their preferred learning style (Brannan, White, & Long, 2016; Hallin, Haggstrom, Backstrom, & Kristiansen, 2015; Shinnick & Woo, 2015; Tutticci, Coyer, Lewis, & Ryan, 2016). No research was found that used preferred learning styles as method for assigning simulation roles.

Shinnick and Woo (2015) conducted a study using Kolb's experiential learning theory to identify how knowledge gains during high-fidelity simulation compared to student learning styles. The study was a comparative design with a convenience sample of 161 students. All participants individually completed a heart failure simulation followed by a group debriefing. Shinnick and Woo identified the students' learning styles as follows: balanced (49.7%), accommodating (24.2%), diverging (18.6%), assimilating (5%), and converging (2.5%). Accommodators use intuition more than logic to make decisions. Divergers like to gather information and are good at generating ideas. Assimilators are focused on abstract concepts and prefer having time about problems. Convergers are good at problem solving and like to experiment with new ideas. A balanced learner uses all four of these learning styles and is able to adapt to various learning environments. The results of the

study found that while knowledge gains were present for all participants, the biggest gains were present for those with diverging, assimilating, or balanced learning styles. The increase in knowledge was statistically significant for only the balanced and diverging learning styles (Shinnick & Woo, 2015).

Hallin, Haggstrom, Backstrom, and Kristiansen (2015) conducted a study to explore the correlation between senior nursing students' learning styles and their ability to make clinical judgments. Participants completed the Productivity Environmental Preference Survey (PEPS) to determine their learning preferences. There were only a few items on the PEPS where participants indicated strong preferences. The majority (78%) of the participants preferred structure when learning as well as working with their peers (68.2%). The Lasater Clinical Judgment Rubric (LCJR) was used to measure the participants' ability to make clinical decisions. Five faculty members collaborated to complete the LCJR while watching the simulation video recordings. Clinical judgment scores were determined for the simulation groups. When correlating learning styles to the LCJR results, there was a statistically significant negative correlation between a preference for structure and the ability to make clinical judgments. This indicated the higher the teams' preference for structure, the lower their ability to make clinical judgments (Hallin et al., 2015). This result was expected as the simulation environment is not highly structured as the simulation scenario changes based on the students' actions. This information is important for faculty as the clinical environment is also an unstructured environment. Faculty need to provide opportunities for students to practice making decisions in an unstructured environment.

Tutticci, Coyer, Lewis, and Ryan (2016) conducted a study to learn if simulation accommodates students with various learning styles. The Kolb Learning Style Inventory was used to determine learning style preferences of undergraduate nursing students. The results of the study identified that 29.8% of the participants were divergers and 25.1% were accommodators. Assimilators accounted for 19.4% of the participants and 16.5% were convergers. The Satisfaction with Simulation Experience Scale was used to measure the participants' satisfaction with the simulation. The mean scores on each item ranged from 4.2 to 4.5 which indicates the participants were satisfied with the experience (Tutticci et al., 2016). These results indicated simulation appeals to students with a variety of learning styles; however, this study did not correlate the satisfaction scores to specific learning styles. This information would be beneficial as it could identify ways to improve the simulation experience for all learners. In addition, this study did not compare learning styles with the students' ability to meet the learning outcomes.

Brannan, White, and Long (2016) conducted a study to determine the influence of nursing students' learning styles on their confidence and knowledge outcomes during simulation. The Index of Learning Styles was used to determine the participants' preferred learning style. The participants were assigned to receive either traditional classroom lecture (n = 38) or a simulation experience (n = 16) related to distributive shock. The majority of the participants had preferences for active (n = 28), sensing (n = 40), visual (n = 33), and sequential (n = 35) learning. This indicates the participants preferred to have information presented in a linear, concrete manner. In addition, the participants preferred hands-on experiences. While confidence levels and knowledge scores improved after the education, no

statistically significant differences between the learning styles were found. The lack of statistical significance could mean the participants' learning style needs were sufficiently met through the educational method used (Brannan et al., 2016). This study supported the use of simulation to appeal to a variety of learning styles; however, it did not address the ability to use the information learned to make clinical decisions.

Gaps in the Literature

While simulation research is growing, research related to how simulation influences students' clinical reasoning skills is limited. The research that exists does support the use of simulation to enhance students' clinical reasoning ability (Gibbs et al., 2014; Lee, Lee, Lee, et al., 2016; Zulkosky et al., 2016). In addition, research related to various simulation roles is limited (Bethards, 2014; Hober & Bonnel, 2014). Despite limited research, there is evidence that suggests students benefit just as much from observing the simulation as direct care providers during the simulation (Bethards, 2014; Hober & Bonnel, 2014; Stegmann et al., 2012). In addition, most of the simulation research focuses on nursing students at the same academic level (Brannan et al., 2008; Eyikara & Baykara, 2018; Gates et al., 2012; Gibbs et al., 2014; Hallin et al., 2015; Howard, 2017; Scherer et al., 2016; Schlairet & Pollock, 2010; Zulkosky et al., 2016).

While much research exists related to identifying learning styles of adult learners, limited research exists that evaluates the effectiveness of teaching strategies for specific learning styles (Blevins, 2014; Hallin, 2014; Pettigrew et al., 2011; Prithishkumar & Michael, 2014). This study provided additional research related to how simulation impacts students' clinical reasoning skills across multiple academic levels. The study also explored

the impact of learning styles on simulation role assignment and provided insight into ways to promote learning for both the direct care providers and simulation observers. The results provided a foundation for future research related to simulation role assignment.

Theoretical Frameworks

Theoretical frameworks provide structure to the entire research process from conceptualization to data analysis (Grant & Osanloo, 2014). This structure is provided by providing an explanation of concepts and how they relate to each other (Grant & Osanloo, 2014). The Clinical Reasoning Model and the Felder-Silverman Learning Style Model will be used to provide structure to the proposed study.

Clinical Reasoning Model

The Clinical Reasoning Model (CRM) describes clinical reasoning as a cyclical process that nurses use to collect cues and process information to provide patient care (Levett-Jones et al., 2010). Levett-Jones et al. (2010) described the eight steps in the CRM which are: looking, collecting, processing, deciding, planning, acting, evaluating, and reflecting. The looking step occurs when the nurse uses facts to consider the patient situation. The collecting step is when the nurse reviews known information about the patient and collects new information. In the processing step, the nurse makes interpretations of the information. The nurse then identifies the patient problems in the deciding phase and establishes goals in the planning phase. The sixth and seventh phases involve acting upon interventions and evaluating the effectiveness of the interventions. The final stage is reflecting on the situation to determine ways to improve in the future (Levett-Jones et al., 2010).

While the CRM consists of eight phases, these phases are not linear in nature. A nurse may complete multiple phases at one time or go back and forth between the stages before making a decision. This model encourages higher order thinking while nurses engage in each step (Levett-Jones et al., 2010; Liou et al., 2015).

Felder-Silverman Learning Style Model

The Felder-Silverman Learning Style Model (FSLSM) was developed to describe learning style differences in students as well as assist faculty in developing teaching strategies that are effective for all students (Felder & Spurlin, 2005). The FSLSM consists of four dimensions. The first dimension is sensing-intuitive which describes how individuals perceive information (Felder & Silverman, 1988). Individuals with a preference for sensing use their senses to gather information. These individuals prefer to use facts and data instead of theories. Individuals with a preference for intuition perceive the world indirectly through speculation and imagination. These individuals prefer to use theories instead of facts and data (Felder & Silverman, 1988).

The second dimension is visual-verbal which describes how individuals prefer information to be presented (Felder & Silverman, 1988). Individuals with a visual preference learn best when information is presented in pictures or diagrams. Individuals with a verbal preference learn best when information is presented using words, either spoken or written (Felder & Silverman, 1988).

The third dimension is sequential-global and describes how individuals prefer to organize information so it can be understood (Felder & Silverman, 1988). Individuals with a sequential preference “follow linear reasoning processes when solving problems” (Felder &

Silverman, 1988, p. 679). They do best at learning simple concepts first and then moving to more complex concepts. Global learners may have periods where they do not understand the material and then they suddenly understand. They are able to skip the simple concepts and move directly to the more complex concepts (Felder & Silverman, 1988).

The fourth dimension is active-reflective and describes how individuals prefer to process information (Felder & Silverman, 1988). Individuals with a preference for active learning prefer to try things out as they are learning. These individuals work well in groups. Individuals with a preference for reflective learning prefer to think things through as they are learning. These individuals work better alone (Felder & Silverman, 1988).

Theory Use

The CRM provides the framework for the simulation experience. In the proposed study, the simulation and debriefing allow the students the opportunity to use all eight steps of the CRM. The first seven steps of the CRM are accomplished during the simulation experience. The last step, reflecting, occurs during the debriefing when students can think about the experience and discuss ways to improve in the future. The CRM also be used to evaluate the participants' clinical reasoning ability after the simulation experience. This will be accomplished by using the Nursing Clinical Reasoning Scale which was developed using the CRM (Liou et al., 2015).

The FSLSM will provide the framework for the study's intervention; purposeful simulation role assignment. The proposed study will use the participants' preference on the active-reflective continuum to assign simulation roles. The participants' preference will be determined by using the Index of Learning Styles which was developed using the FSLSM

(Felder & Silverman, 1988). Participants who have a preference for active learning are best suited to the direct care provider role in simulation. Participants with a preference for reflective learning are best suited to the observer role in simulation.

Conclusion

Early simulation research supports the use of simulation to increase nursing students' knowledge and skill development. Current simulation research supports the use of simulation to increase nursing students' ability to use clinical reasoning skills to make clinical decisions. There is also research that suggests those who observe simulation achieve the same learning outcomes as those who provide direct care during the simulation. The majority of this research focuses on lower level outcomes such as student satisfaction and knowledge acquisition. No research was found that explored different methods of assigning simulation roles.

The majority of current research related to learning styles focuses on identifying students' preferred learning styles and not on the effectiveness of teaching strategies based on students' preferred learning styles. Research does suggest that simulation is effective for students with a variety of preferred learning styles. No research was found that used students' preferred learning styles to assign simulation roles.

The proposed study will be guided by the CRM and FSLSM. The CRM will provide the framework for the simulation experience while the FSLSM will provide the framework for the study's intervention. The proposed study will add to the body of knowledge related to both simulation and learning styles. The proposed study will also provide a foundation for future simulation role assignment research.

CHAPTER 3

METHODOLOGY

Research Design

To fulfill the purpose of the study, a double-blind, randomized control trial design was used to explore how assigning simulation roles using learning styles influences nursing students' clinical reasoning skills. The research question was "What is the impact of purposeful simulation role assignment, based on students' preferred learning style, on nursing students' clinical reasoning skills?" The hypothesis was that assigning simulation roles based on students' preferred learning style will improve nursing students' clinical reasoning skills.

The independent variable was the method of simulation role assignment. Participants were randomly assigned to either the experimental or control group. In the experimental group, participants were assigned simulation roles that were congruent with their identified learning style. Participants in the control group were assigned simulation roles that were not congruent with their identified learning style. The dependent variable was the participants' clinical reasoning skills. Clinical reasoning was measured prior to the simulation experience as well as after the simulation debriefing.

Setting/Sample

Participants were recruited from a private, not-for-profit institution of higher learning located in west-central Illinois that grants the baccalaureate nursing degree. The college has a simulation center with nine high-fidelity simulators as well as the ability to record simulation experiences. High-fidelity simulators are fully-programmable computerized manikins that are

able to simulate multiple physical responses such as blinking and breathing. The simulators vital signs, heart sounds, and breath sounds can be programmed to simulate almost any clinical situation. In addition, the individual controlling the simulator can portray a wide range of verbal and emotional responses using a microphone.

The college has approximately 250 baccalaureate nursing students in any given academic year. The college also has an agreement with a local community college to provide nursing courses to associate degree nursing students. There are approximately 20 associate degree nursing students at the college in any given academic year. The students are primarily Caucasian females between the ages of 19 and 25 years of age. The majority of students are from Illinois, Missouri, and Iowa.

A convenience sample was recruited from prelicensure students from various academic levels. The academic levels included second through fourth year baccalaureate students and final year associate degree students. The majority of the current simulation research focuses on students at one academic level (Brannan et al., 2008; Eyikara & Baykara, 2018; Gates et al., 2012; Gibbs et al., 2014; Hallin et al., 2015; Howard, 2017; Scherer et al., 2016; Schlairet & Pollock, 2010; Zulkosky et al., 2016). Including students from all academic levels allows comparison between the levels. Inclusion criteria included nursing students who are at least 18 years old. Participants were recruited during a regularly scheduled class period prior to the scheduled simulation experiences.

An a priori power analysis was completed, using G*Power version 3.1.9.2, to determine the sample size needed to detect a medium effect size ($\alpha = .05$ and power = .80) (Faul, Erdfelder, Lang, & Buchner, 2007). The power analysis identified a sample size of 129

was needed. To obtain this sample size, a total of 227 nursing students were approached to participate in the study. Little published simulation research has included the response rate. When this information has been included, the response rate has ranged from 68 to 97% (Beischel, 2013; Hallin et al., 2015; Kelly, Hager, & Gallagher, 2014; Thidemann & Söderhamn, 2013). The response rate for this study was 94.27% with 214 students agreeing to participate in the study. The final sample size was 204 as 10 participants (4.67%) did not complete the post-test data collection. This attrition could be attributed to participant illness and traveling abroad for other courses. The participants were randomly assigned to either the experimental or control group.

Protection of Participants

The University of Missouri-Kansas City Institutional Review Board (IRB) reviewed the study and determined it to be exempt from IRB review and approval (Appendix A). In addition, a letter of support was obtained from the participating study site (Appendix B). All students enrolled in a clinical course were approached by a research assistant to participate in the study. All clinical courses at all levels have incorporated simulation into the clinical rotation. All students completed the simulation experience; however, only those who gave consent completed the tools. The primary investigator (PI) is the Simulation Center Coordinator and is well known to the students. This could result in the students feeling undue pressure to participate in the research study. To account for this, a research assistant, who is not a faculty member, made initial contact with the students by providing information about the study including the purpose as well as potential risks and benefits of participating in the study.

Several measures were used to protect the participants' anonymity and confidentiality. The research assistant obtained informed consent from the participants and collected the data. The participants provided a unique identification number when they completed the study instruments. The unique identifier was documented on the consent form as well as all the study instruments. The research assistant created a code sheet that included the participant name and unique identifier. The code sheet and consent forms were stored in a locked cabinet and only the research assistant had access to this information. Prior to providing the data to the PI, the research assistant ensured the instruments did not contain any identifying information. The de-identified measurement tools were stored in a locked cabinet that was only accessible to the PI. The de-identified data were entered into IBM SPSS v25. The electronic data were only accessible to the PI.

Those who chose not to participate in the study were also instructed to document their name and a unique identification number. The research assistant created a code sheet that included the name and unique identifier. The code sheet was stored in a locked cabinet and only the research assistant had access to this information. The research assistant provided the unique identifiers to the PI for the purpose of making simulation role assignments.

On the day of the simulation experience, a faculty member other than the PI used the unique identifier to provide all students their simulation role assignment. The PI was not present when the role assignments were provided to the students. This ensured that no one was able to distinguish the participants from the non-participants.

Instruments

Three tools were used to describe the sample and measure the study variables; Demographic Information, Index of Learning Styles (ILS), and Nurses Clinical Reasoning Scale (NCRS). The Demographic Information was used to describe the sample. Variables included age, level in the nursing program, gender, previous simulation experience, and previous healthcare experience. The Demographic Information was completed prior to the intervention and is included in Appendix C.

Index of Learning Styles. The ILS was used to identify the students' preferred learning styles. This tool was chosen as it includes questions related to how learners process information as well as how they receive information. In addition, the ILS has one dimension dedicated to active/reflective learning which is the focus of this study.

The ILS was created using Kolb's learning style model and the Myers-Briggs Type Indicator (Felder & Spurlin, 2005). The inventory consists of 44 items to assess four dimensions of learning; active/reflective, sensing/intuiting, visual/verbal, and sequential/global (Felder & Spurlin, 2005). Each item consists of a statement with two possible endings. Participants choose the ending that best fits them (Felder & Spurlin, 2005). The Cronbach's alpha for the four dimensions ranges from .53 to .76 (Felder & Spurlin, 2005). Since the ILS measures attitudes, a Cronbach's alpha of greater than .5 is acceptable (Felder & Spurlin, 2005). Students at 10 universities were surveyed to determine construct validity (Felder & Spurlin, 2005). A consistent pattern of preferred learning styles was found among the engineering students (Felder & Spurlin, 2005). Distinct and predictable differences in learning styles were identified in non-engineering students (Felder & Spurlin,

2005). These results indicate the survey has construct validity (Felder & Spurlin, 2005). The ILS was completed prior to the intervention and the results were used to make group assignments. The ILS is available for free to students and faculty for non-commercial use (Felder & Spurlin, 2005). The tool can be found in Appendix D.

Nursing Clinical Reasoning Scale. The NCRS was used to measure the students' clinical reasoning. Liou et al. (2015), used the Clinical Reasoning Model to develop the scale. The scale consists of 15 items that are scored on a 5 point Likert scale with 1 being "strongly disagree" and 5 being "strongly agree" (Liou et al., 2015). A total score is determined with a higher score indicating a higher level of clinical reasoning. Content validity was determined by calculating both item and scale content validity indexes. Both of these measures were 1.0 which indicates content validity (Liou et al., 2015). Based on the reliability testing results, the NCRS is a reliable tool. Internal consistency is 0.93-0.94 which indicates the tool has internal consistency (Liou et al., 2015). The test-retest reliability is supported by the test-retest internal class correlation of 0.87 (Liou et al., 2015). The tool can be found in Appendix E. Permission to use the tool was received from the authors and is provided in Appendix F.

Procedure

The PI provided education to the research assistant both verbally and in writing. To validate the research assistant's understanding, the assistant explained the study to the PI. The PI provided education to the research assistant until the research assistant was able to accurately demonstrate the consent process.

The research assistant provided information about the study at a class period prior to the scheduled simulation experience. After the students consented to participate in the study, baseline data (Demographic Information, ILS, and NCRS) was collected by the research assistant. The participants documented the last four digits of their phone number and their two-digit month of birth on the instruments to serve as a unique identifier. The research assistant de-identified the data as described earlier.

After the baseline data were collected and de-identified, the PI reviewed each participants' responses to the ILS to determine their preferred learning style. The PI used the unique identifiers to randomly assign each participant to either the experimental or control group. The experimental group was assigned simulation roles that were congruent with the participant learning styles. Participants with a preference for active learning were assigned the direct care provider role and those with a preference for reflective learning were assigned the observer role. The control group was assigned simulation roles that were not congruent with the participant learning styles. Participants with a preference for active learning were assigned the observer role and those with a preference for reflective learning were assigned the direct care provider role. The control group was not assigned simulation roles randomly which is the customary method of role assignment. This was done to prevent having participants in the control group that were assigned simulation roles that were congruent to their learning styles. After assigning simulation roles to the participants, the PI used the unique identifiers to assign simulation roles to the students not participating in the study. The non-participants were assigned roles randomly which is the current method to assign simulation roles.

On the day of the simulation experience, a faculty member other than the PI provided all students with their assigned roles by using the unique identifier. The observers were provided an observation guide to use while observing the simulation. The observation guide provided guidance on items to look for (i.e. what went well, what could be improved) but did not provide any clues as to the scenario progression. The observation guide is provided in Appendix G. Once the simulation roles were provided, the simulation and debriefing were completed. The simulation and debriefing were conducted by simulation center faculty in conjunction with the clinical faculty. After the simulation and debriefing were completed, the participants completed the NCRS post-test and returned it to a specified container in the classroom. The PI collected the tools after all participants left the classroom. The procedure detail is provided in Appendix H.

The intervention was repeated until all 214 students were assigned simulation roles and completed the simulation and debriefing. The intervention took place in the simulation center at the institution previously described. The PI developed a checklist to document the intervention. The checklist was based on the detailed intervention protocol available in Appendix H. The checklist was completed each time the intervention was conducted to maintain the fidelity of the intervention.

Data Analysis

The PI entered the data into IBM Statistical Package for the Social Sciences (SPSS) version 25 (IBM, 2017) and verified its accuracy by entering the data twice. The data were cleaned by looking for non-matching information as well as outliers (Plichta, Kelvin, & Munro, 2012). The PI conducted the data analysis using an alpha level of 0.05 for all

statistical tests (Polit & Beck, 2012). The data analysis was verified by the School of Nursing biostatistician. Demographic data were analyzed using descriptive statistics. Hypothesis testing was completed on the study's hypothesis; assigning simulation roles based on students' preferred learning style will improve nursing students' clinical reasoning skills. The outcome measure, clinical reasoning, was measured using the total score, a ratio level variable. The total score was used to conduct paired *t* tests to determine the difference in mean scores within groups before and after the simulation. Data were analyzed to determine if the demographic information (age, gender, academic level, and previous simulation experience) influenced the results. The difference in mean scores between the experimental and control groups was also determined by conducting independent *t* tests.

Conclusion

This double-blind, randomized control trial explored the impact of purposeful simulation role assignment, based on students' preferred learning style, on nursing students' clinical reasoning. The study used a convenience sample of prelicensure nursing students of varying academic levels. Procedures were put into place, including IRB approval, to protect the participants' confidentiality and anonymity. The control group was assigned simulation roles that were not congruent with the participants' preferred learning styles. The experimental group was assigned simulation roles that were congruent with the participants' preferred learning styles. The ILS was used to determine the participants' preferred learning styles and the NCRS was used to determine the participants' clinical reasoning ability. Data were analyzed using SPSS version 25.

CHAPTER 4

RESULTS

The purpose of the randomized control trial was to determine the influence of using purposeful role assignment, based on preferred learning style, on nursing students' clinical reasoning. The independent variable was the method of simulation role assignment. In the experimental group, simulation roles were assigned that were congruent with the participants' preferred learning style. In the control group, simulations roles were assigned that were not congruent with the participants' preferred learning style. The dependent variable was the participants' clinical reasoning score as measured by the Nurses Clinical Reasoning Scale. This chapter presents a description of the sample as well as the results of the data analysis.

Sample Description

A convenience sample was recruited from all clinical courses at a midwestern college of nursing. A total of 214 nursing students consented to participate in the study. Ten participants did not complete the post-test data collection resulting in a sample size of 204. The age range of the sample was 19 years to 49 years with a mean age of 24. The majority of the sample were between 19 and 25 years ($n = 147$, 72%). Forty-three of the participants (21%) were between 26 and 35 years and 14 of the participants (7%) were between 36 and 49 years of age. The majority of the sample were female ($n = 185$, 90.7%) which is consistent with the nursing workforce which was 89.3% female in 2016 (DataUSA, n.d.). According to the National League for Nursing (2016), 85% of nursing students were female in 2016.

The majority of the sample were baccalaureate nursing students (n = 179, 87.7%) while 25 of the participants (12.3%) were associate degree nursing students. The baccalaureate nursing students were primarily juniors (n = 80, 44.7%) followed by sophomores (n = 54, 30.2%) and then seniors (n = 45, 25.1%). The associate degree nursing students were enrolled in the same courses as the juniors in the baccalaureate nursing program. The participants had various levels of simulation and healthcare experience. This is described in Table 1.

Table 1: Simulation and Healthcare Experience

	Number of Participants	% of Sample
Simulation Experience		
None	12	5.9%
1-2 prior simulations	29	14.2%
3-4 prior simulations	69	33.8%
5 or more prior simulations	94	46.1%
Healthcare Experience		
None	72	35.3%
CNA/PCA	93	45.6%
LPN	15	7.4%
EMT/Paramedic	2	1.0%
Other	22	10.8%

The Index of Learning Styles (ILS) was used to determine the participants' preferred learning style. The ILS consists of four continuums: active/reflective, sensing/intuitive, visual/verbal, and sequential/global. Participants could have a mild, moderate, or strong preference for one element on each continuum. This study used the participants' preference on the active/learning continuum to assign simulation roles. The majority of the sample (n = 140, 68.6%) had a preference for active learning and 64 of the participants (31.4%) preferred reflective learning. For those that preferred active learning, 80 had a mild preference, 46 had a moderate preference, and 14 had a strong preference. For those that preferred reflective

learning, 47 had a mild preference, 14 had a moderate preference, and 3 had a strong preference.

The participants were randomly assigned to either the experimental or control group. This resulted in 106 participants in the experimental group and 98 in the control group. The experimental group consisted of 95 baccalaureate nursing students and 11 associate degree nursing students. Out of the baccalaureate students, 32 were sophomores, 43 were juniors, and 20 were seniors. The experimental group consisted primarily of participants with a preference for active learning ($n = 77$, 72.6%) while 29 (27.4%) preferred reflective learning.

The control group consisted of 84 baccalaureate nursing students and 14 associate degree nursing students. Out of the baccalaureate students, 22 were sophomores, 37 were juniors, and 25 were seniors. The experimental group consisted primarily of participants with a preference for active learning ($n = 63$, 64.3%) while 35 (35.7%) preferred reflective learning.

Data Analysis

Data analysis was completed using SPSS version 25. Paired t -tests were used to answer the study's research question which was: What is the impact of purposeful simulation role assignment, based on students' preferred learning style, on nursing students' clinical reasoning skills? The researcher hypothesized that assigning simulation roles based on students' preferred learning style would improve nursing students' clinical reasoning skills.

Prior to calculating the paired t tests, the data were analyzed to check for the assumptions of normality, linearity, and homogeneity of variance. Normality can be assumed by reviewing histograms that revealed a fairly equal distribution of all variables assessed. A

scatterplot confirmed the variables were related in a linear fashion. A Levene's test was conducted to determine the homogeneity of variance. Independent sample *t* tests were conducted comparing the experimental and control groups. Equal variances were assumed in all variables based on the results of the Levene's test.

Overall Change in Clinical Reasoning

The pre-test clinical reasoning score for the entire sample ranged from 31 to 75 with a mean of 55.48. The post-test clinical reasoning score for the entire sample ranged from 41 to 75 with a mean of 59.28 which was statistically significantly higher than the pre-test clinical reasoning score ($t = -9.067$, $p < 0.001$). There was also a statistically significant increase in clinical reasoning scores for the direct care providers ($t = -6.317$, $p < 0.001$) and observers ($t = -6.685$, $p < 0.001$) in the entire sample.

The pre-test clinical reasoning score for the experimental group ranged from 31 to 75 with a mean of 55.17. The post-clinical reasoning score for the experimental group ranged from 41 to 75 with a mean of 59.21 which was statistically significantly higher than the pre-test clinical reasoning score ($t = -6.754$, $p < 0.001$). There was also a statistically significant increase in clinical reasoning scores for the direct care providers ($t = -5.963$, $p < 0.001$) and observers ($t = -3.134$, $p = 0.004$) in the experimental group.

The pre-test clinical reasoning score for the control group ranged from 31 to 69 with a mean of 55.82. The post-clinical reasoning score for the experimental group ranged from 43 to 75 with a mean of 59.37 which was statistically significantly higher than the pre-test clinical reasoning score ($t = -6.029$, $p < 0.001$). There was also a statistically significant

increase in clinical reasoning scores for the direct care providers ($t = -2.590$, $p = 0.014$) and observers ($t = -5.988$, $p < 0.001$) in the control group.

The differences in the mean pre and post-clinical reasoning scores based on gender and age for the experimental group are listed in Table 2. There was a statistically significant difference in clinical reasoning scores among females but not males. This could be attributed to low numbers of male participants. There was also a statistically significant difference in clinical reasoning scores among all the age groups.

Table 2: Clinical reasoning by age and gender: Experimental group

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	<i>t</i> test	<i>p</i> value
Female	96	55.21	59.54	-6.710	<0.001*
Male	10	54.80	56.00	-1.230	0.250
19-25 years	73	54.26	58.45	-5.769	<0.001*
26-35 years	24	58.13	61.04	-2.399	0.025*
36-49 years	9	54.67	60.44	-2.709	0.027*

*Significant at the 0.05 probability level

The differences in the mean pre and post-clinical reasoning scores based on gender and age for the control group are listed in Table 3. There was a statistically significant difference in clinical reasoning scores among females as well as males. There was also a statistically significant difference in clinical reasoning scores among all the age groups except those 36 to 49 years. This could be attributed to low numbers of participants in this age range.

Table 3: Clinical reasoning by age and gender: Control group

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	t test	p value
Female	89	55.63	59.19	-5.602	<0.001*
Male	9	57.67	61.11	-2.542	0.035*
19-25 years	74	56.04	59.53	-5.080	<0.001*
26-35 years	19	55.11	59.63	-3.586	0.002*
36-49 years	5	55.20	56.00	-.289	0.787

*Significant at the 0.05 probability level

In the experimental group, 11 of the participants were associate degree students and 95 were baccalaureate students. The mean pre-clinical reasoning score for the associate degree students was 57.73 and the post-clinical reasoning score was 62.09. This difference was statistically significant ($t = -2.451$, $p = 0.034$). The mean pre-clinical reasoning score for the baccalaureate students was 54.87 and the post-clinical reasoning score was 58.87 which was statistically significantly higher than the pre-clinical reasoning score ($t = -6.276$, $p < 0.001$).

In the control group, 14 of the participants were associate degree students and 84 were baccalaureate students. The mean pre-clinical reasoning score for the associate degree students was 55.71 and the post-clinical reasoning score was 57.71. This difference was not statistically significant ($t = -1.380$, $p = 0.191$). The mean pre-clinical reasoning score for the baccalaureate students was 55.83 and the post-clinical reasoning score was 59.64 which was statistically significantly higher than the pre-clinical reasoning score ($t = -5.930$, $p < 0.001$).

The differences in pre and post clinical reasoning scores in baccalaureate students based on level in the program are listed in Tables 4 and 5. In the experimental group, all levels of students had a statistically significant increase in clinical reasoning scores. In the

control group, all levels of students, except seniors, had a statistically significant increase in clinical reasoning scores.

Table 4: Clinical reasoning by level in program: Experimental group

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	t test	p value
Sophomore	32	50.31	54.22	-3.237	0.003*
Junior	43	56.95	61.16	-4.451	< 0.001*
Senior	20	57.70	61.40	-3.037	0.007*

*Significant at the 0.05 probability level

Table 5: Clinical reasoning by level in program: Control group

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	t test	p value
Sophomore	22	50.45	55.32	-3.727	0.001*
Junior	37	56.68	61.43	-5.521	<0.001*
Senior	25	59.32	60.80	-1.203	0.241

*Significant at the 0.05 probability level

The change in mean clinical scores was also explored based on the participants' prior simulation and healthcare experience. In the experimental group, there was a statistically significant increase in clinical reasoning in all groups except those who were also LPNs. In the control group, there was a statistically significant increase in clinical reasoning in all groups except those with 1-2 previous simulations, those who were also LPNs and those who had other healthcare experience. This other healthcare experience included experience such as emergency room technician, lifeguard, phlebotomist, psychiatric technician, medical assistant, and emergency room scribe. Detailed information is provided in Tables 6 and 7.

Table 6: Clinical reasoning by experience: Experimental group

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	t test	p value
Simulation Experience					
None	8	47.88	53.75	-2.722	0.030*
1-2 simulations	16	53.25	57.88	-2.506	0.024*
3-4 simulations	40	55.73	59.78	-4.136	< 0.001*
5 or more simulations	42	56.76	60.21	-3.890	< 0.001*
Healthcare Experience					
None	42	52.69	57.12	-4.529	< 0.001*
CNA/PCA	44	57.07	61.25	-4.388	< 0.001*
LPN	6	54.67	56.67	-.612	0.567
Other	14	56.86	60.14	-2.788	0.015*

*Significant at the 0.05 probability level

Table 7: Clinical reasoning by experience: Control group

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	t test	p value
Simulation Experience					
None	4	40.75	52.00	-5.084	0.015*
1-2 simulations	13	52.54	53.00	-.335	0.743
3-4 simulations	29	56.07	59.62	-3.960	< 0.001*
5 or more simulations	52	57.65	61.38	-4.375	< 0.001*
Healthcare Experience					
None	30	54.97	57.93	-2.741	0.010*
CNA/PCA	49	56.06	60.57	-5.295	< 0.001*
LPN	9	55.56	56.67	-.565	0.588
Other	8	58.25	60.38	-1.359	0.216

*Significant at the 0.05 probability level

The change in mean clinical scores was also explored based on the participants' preference for active or reflective learning. There was a statistically significant difference in all groups except those with a strong preference for active learning as well as those with a mild, moderate, or strong preference for reflective learning. Detailed information is provided in Tables 8 and 9. Since some of the learning style groups had a small number of

participants, clinical reasoning scores were also explored based on the participants' overall preference for active or reflective learning. Detailed information is provided in Table 10.

Table 8: Clinical reasoning based on learning style: Experimental group

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	t test	p value
Active, mild	43	55.33	59.95	-4.595	< 0.001*
Active, moderate	26	55.08	59.04	-3.512	0.002*
Active, strong	8	56.13	60.50	-1.721	0.129
Reflective, mild	22	54.05	57.23	-2.372	0.027*
Reflective, moderate	6	58.00	61.17	-1.883	0.118
Reflective, strong	1		Unable to calculate		

*Significant at the 0.05 probability level

Table 9: Clinical reasoning based on learning style: Control group

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	t test	p value
Active, mild	37	55.49	60.03	-5.356	< 0.001*
Active, moderate	20	55.20	59.15	-4.031	0.001*
Active, strong	6	59.50	63.17	-1.075	0.332
Reflective, mild	25	55.64	58.44	-1.885	0.072
Reflective, moderate	8	55.88	56.75	-.516	0.622
Reflective, strong	2	59.00	60.00	-.333	0.795

*Significant at the 0.05 probability level

Table 10: Clinical reasoning based on overall learning style

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	t test	p value
Active, experimental	77	55.32	59.70	-6.084	<0.001*
Active, control	63	55.78	60.05	-6.514	<0.001*
Reflective, experimental	29	54.76	57.90	-2.952	0.006*
Reflective, control	35	55.89	58.14	-1.991	0.055

*Significant at the 0.05 probability level

There were three groups that did not have statistically significant changes in clinical reasoning in either the experimental or control groups. These groups were licensed practical

nurses and those with a strong preference for active learning or a moderate preference for reflective learning. The lack of significance could be related to these groups having small numbers; therefore, overall paired *t* tests were calculated for these groups. There was not a statistically significant increase in clinical reasoning in any of these groups. Detailed information is provided in Table 11.

Table 11: Overall clinical reasoning: LPN and learning style

	n	Mean pre-clinical reasoning score	Mean post-clinical reasoning score	<i>t</i> test	<i>p</i> value
Licensed practical nurses	15	55.20	56.67	-.866	0.401
Active learning, strong	14	57.57	61.64	-2.057	0.060
Reflective learning, moderate	14	56.79	58.64	-1.543	0.147

There were several groups that had a statistically significant increase in clinical reasoning in both the experimental and control groups. Independent *t* tests were completed with these groups to determine if there was a significant difference between the experimental and control groups. No statistical significance was found between the experimental and control groups. Detailed information is provided in Table 12.

Table 12: Clinical reasoning: Experimental versus Control

	Mean difference between groups (pre)	<i>t</i> test (pre)	<i>p</i> value (pre)	Mean difference between groups (post)	<i>t</i> test (post)	<i>p</i> value (post)
All participants	-.647	-.660	0.510	-.160	-.163	0.871
Direct Care Providers	-1.128	-.801	0.425	.359	.263	0.793
Observers	-.621	-.400	0.690	-1.206	-.740	0.461
Female	-.421	-.402	0.689	.351	.336	0.737
Age 19-25	-1.780	-1.484	0.140	-1.075	-.961	0.338
Age 26-35	3.020	1.599	0.117	1.410	.625	0.535
BSN	-.960	-.903	0.367	-.769	-.753	0.452
Sophomores	-.142	-.067	0.947	-1.099	-.712	0.479
Juniors	.278	.199	0.843	-.270	-.179	0.858
No simulation experience	7.125	1.864	0.092	1.750	.771	0.459
3-4 previous simulations	-.344	-.210	0.834	.154	.093	0.926
5 or more previous simulations	-.892	-.778	0.439	-1.170	-.837	0.405
CNA/PCA	1.007	.720	0.473	.679	.517	0.606
No healthcare experience	-2.276	-1.262	0.211	-.814	-.495	0.622
Mild active learning preference	-.161	-.088	0.930	-.074	-.044	0.965
Moderate active learning preference	-.123	-.067	0.947	-.112	-.056	0.956

Conclusion

The convenience sample consisted of 204 nursing students who were primarily female, baccalaureate nursing students between the ages of 19 and 25 years. The results of the study indicate the overall sample had a statistically significant increase in clinical reasoning scores after the simulation experience. In addition, both the experimental (n = 106) and control (n = 98) groups had an overall statistically significant increase in clinical reasoning scores.

CHAPTER 5

DISCUSSION

To maximize the use of simulation resources, students are assigned various simulation roles. There is currently no research related to the best methods to assign simulation roles. Student feedback related to their perceptions of the observer and direct care provider roles points to differences in learning styles (Hober & Bonnel, 2014). This study was conducted to determine the impact of using students' preferred learning styles to assign simulation roles on their clinical reasoning ability.

A double-blind, randomized control trial was completed using the participants' preferred learning styles to assign simulation roles. The experimental group was assigned simulation roles that were congruent with the participants' preferred learning style. The control group was assigned simulation roles that were not congruent with the participants' preferred learning style. The participants completed the Nurses Clinical Reasoning Scale prior to and after a simulation experience. The data were analyzed to answer the study's research question.

Research Question Conclusion

The study's research question was: What is the impact of purposeful simulation role assignment, based on students' preferred learning style, on nursing students' clinical reasoning skills? The results of the study indicated that both the experimental and control groups had a statistically significant increase in clinical reasoning after the simulation experience. In addition, there was not a statistically significant difference in clinical

reasoning between the experimental and control groups. These results support assigning simulation roles randomly.

However, the results also suggest there are some students that would benefit from assigning simulation roles based on preferred learning style. Those with a preference for reflective learning had a statistically significant increase in clinical reasoning in the experimental group but not in the control group. This suggests that those with a preference for reflective learning may benefit from assigning simulation roles based on their preferred learning style. While providing direct care during simulation, students may feel pressure to perform well in front of their faculty and/or peers. This pressure could cause the student enough anxiety to negatively impact learning, especially for students with a preference for reflective learning. The data analysis also found similar results for the associate degree students as well as the senior level baccalaureate students.

The clinical reasoning scores for participants who were also licensed practical nurses were unexpected. There was not a statistically significant difference in clinical reasoning scores for licensed practical nurses. One thought is that since these participants were already nurses, they had experiences that enhanced their clinical reasoning ability leading to simulation not being as effective for this group. However, when looking at the sample's mean clinical reasoning scores based on their previous healthcare experience, this does not appear to be true. There were four categories of previous healthcare experience; none, certified nursing assistant, licensed practical nurse, and other. When arranging the mean clinical reasoning scores in order from lowest to highest, the licensed practical nurses were consistently at or near the bottom of the list. One reason for this may be difficulty in

transitioning from the role of licensed practical nurse to registered nurse. This could be attributed to the differences between the role of the licensed practical nurse and the registered nurse. The role of the licensed practical nurse focuses on providing basic nursing care while the role of the registered nurses focuses on critical thinking and decision making. More research is needed related to licensed practical nurses who are studying to become registered nurses.

Limitations

The study did have some limitations. First, the study lacked diversity in the sample. There were some groups that had small numbers (associate degree students, licensed practical nurses, those with a preference for reflective learning) which may have influenced the results. Studies with larger, more diverse samples are needed. The second limitation was the use of a self-report tool to measure clinical reasoning. A self-report tool may not accurately measure clinical reasonings as participants may be unable to accurately evaluate their own clinical reasoning ability. The third limitation was the imbalance in numbers of participants with a preference for active versus reflective learning. There were more than twice as many participants with a preference for active learning than reflective learning. This may have influenced the results as there were more direct care providers than observers.

Implications for Nursing Education

The results of this study support the use of simulation to increase the clinical reasoning ability of nursing students as the overall sample had a statistically significant increase in clinical reasoning. This is consistent with previous simulation research (Alamrani et al., 2018; Gibbs et al., 2014; Lee, Lee, Lee, et al., 2016). The results of this study also

provide important information related to the role of simulation observers. The majority of simulation research has focused on the role of the direct care provider (Bambini et al., 2009; Cardoza & Hood, 2012; Hart et al., 2014; Schoessler et al., 2012). This study examined the clinical reasoning ability of both direct care providers and observers after a simulation experience. There was a statistically significant increase in clinical reasoning for both the direct care providers and the observers. In addition, there was not a statistically significant difference in clinical reasoning between the direct care providers and observers when comparing the experimental and control groups. This supports the idea that simulation observers achieve the same outcomes as direct care providers.

Recommendations for Future Research

One recommendation for future research would be to replicate the study with a larger, more diverse sample. Qualitative data could also be collected to provide more information about the students' perceptions of the different simulation roles. Another area for future research would be to use different methods of observation. For the purpose of this research study, the observers were in the simulation room with the direct care providers. The observers sat behind a two-way mirror that allowed them to observe the simulation without interfering with the simulation. A future study could consist of the observers watching the simulation in another room using a live video stream. Another option would be to have the observers watch a recording of the simulation and complete a written debriefing exercise.

Another area of future research would be to explore the influence of repeated simulation experiences on students' clinical reasoning skills. Students could participate in one simulation experience as either a direct care provider or observer. After the first

simulation, the students could switch roles and participate in a different simulation. Clinical reasoning could be measured before each simulation as well as after the second simulation.

Research is also needed that measures clinical reasoning using faculty evaluation instead of self-report. This will provide a more effective measure of clinical reasoning. In addition, research comparing faculty evaluation of the students' clinical reasoning to the students' evaluation may be beneficial to identify the students' ability to self-evaluate. Any discrepancies between the faculty and student evaluations would encourage discussion that could further increase the students' clinical reasoning.

Conclusion

To maximize the use of simulation resources, students are often assigned various simulation roles. No research was identified that explored various methods of assigning simulation roles. This study explored the influence of using students' preferred learning style as a method of role assignment. The results of this study support random simulation role assignment for the majority of students. However, there are some groups of students who may benefit from assigning simulation roles based on their preferred learning style. These groups are those with a preference for reflective learning, associate degree students, and senior level baccalaureate students. The results of this study also support that simulation observers are able to achieve the same learning outcomes as the direct care providers.

References

- Alamrani, M. H., Alammam, K. A., Alqahtani, S. S., & Salem, O. A. (2018). Comparing the effects of simulation-based and traditional teaching methods on the critical thinking abilities and self-confidence of nursing students. *Journal of Nursing Research*, 26(3), 152–157. <https://doi.org/10.1097/jnr.0000000000000231>
- Al-Ghareeb, A. Z., & Cooper, S. J. (2016). Barriers and enablers to the use of high-fidelity patient simulation manikins in nurse education: An integrative review. *Nurse Education Today*, 36, 281–286. <https://doi.org/10.1016/j.nedt.2015.08.005>
- AlKhasawneh, E. (2013). Using VARK to assess changes in learning preferences of nursing students at a public university in Jordan: Implications for teaching. *Nurse Education Today*, 33(12), 1546–1549. <https://doi.org/10.1016/j.nedt.2012.12.017>
- Bambini, D., Washburn, J., & Perkins, R. (2009). Outcomes of clinical simulation for novice nursing students: Communication, confidence, clinical judgment. *Nursing Education Perspectives*, 30(2), 79–82.
- Beischel, K. P. (2013). Variables affecting learning in a simulation experience: A mixed methods study. *Western Journal of Nursing Research*, 35(2), 226–247. <https://doi.org/10.1177/0193945911408444>
- Bethards, M. L. (2014). Applying social learning theory to the observer role in simulation. *Clinical Simulation in Nursing*, 10(2), e65–e69. <https://doi.org/10.1016/j.ecns.2013.08.002>

- Bhattacharyya, E., & Shariff, A. B. M. (2014). Learning style and its impact in higher education and human capital needs. *Procedia - Social and Behavioral Sciences*, 123, 485–494. <https://doi.org/10.1016/j.sbspro.2014.01.1448>
- Blevins, S. (2014). Nurses as educators: Understanding learning styles. *MEDSURG Nursing*, 23(1), 59–60.
- Brannan, J. D., White, A., & Bezanson, J. L. (2008). Simulator effects on cognitive skills and confidence levels. *Journal of Nursing Education*, 47(11), 495–500. <https://doi.org/10.3928/01484834-20081101-01>
- Brannan, J. D., White, A., & Long, J. (2016). Learning styles: Impact on knowledge and confidence in nursing students in simulation and classroom. *International Journal of Nursing Education Scholarship*, 13(1), 63–73. <https://doi.org/10.1515/ijnes-2015-0052>
- Cardoza, M. P., & Hood, P. A. (2012). Comparative study of baccalaureate nursing student self-efficacy before and after simulation. *CIN: Computers, Informatics, Nursing*, 30(3), 142–147. <https://doi.org/10.1097/NCN.0b013e3182388936>
- Collins, T., Lambert, L., Helms, C. D., & Minichiello, V. M. (2017). Use of mindful observer to extend simulation learning experience. *Nursing Education Perspectives*, 38(2), 98–99. <https://doi.org/doi:10.1097/01.NEP.0000000000000087>
- DataUSA. (n.d.). Registered nurses. Retrieved from Data USA website: <https://datausa.io/profile/soc/291141/#demographics>

- Eyikara, E., & Baykara, Z. G. (2018). Effect of simulation on the ability of first year nursing students to learn vital signs. *Nurse Education Today*, 60, 101–106.
<https://doi.org/10.1016/j.nedt.2017.09.023>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191.
- Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. *Engineering Education*, 78(7), 674–681.
- Felder, R. M., & Spurlin, J. (2005). Applications, reliability and validity of the Index of Learning Styles. *International Journal of Engineering Education*, 21(1), 103–113.
- Foronda, C., Liu, S., & Bauman, E. B. (2013). Evaluation of simulation in undergraduate nurse education: An integrative review. *Clinical Simulation in Nursing*, 9(10), e409–e416. <https://doi.org/10.1016/j.ecns.2012.11.003>
- Gates, M. G., Parr, M. B., & Huguen, J. E. (2012). Enhancing nursing knowledge using high-fidelity simulation. *Journal of Nursing Education*, 51(1), 9–15.
<https://doi.org/10.3928/01484834-20111116-01>
- Gibbs, J., Trotta, D., & Overbeck, A. (2014). Human patient simulation versus case study: Which teaching strategy is more effective in teaching nursing care for the hypoglycemic patient? *Teaching and Learning in Nursing*, 9(2), 59–63.
<https://doi.org/10.1016/j.teln.2014.01.002>

- Gore, T., Van Gele, P., Ravert, P., & Mabire, C. (2012). A 2010 survey of the INACSL membership about simulation use. *Clinical Simulation in Nursing*, 8(4), e125–e133.
<https://doi.org/10.1016/j.ecns.2012.01.002>
- Grant, C., & Osanloo, A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research: Creating the blueprint for your “house.” *Administrative Issues Journal Education Practice and Research*.
<https://doi.org/10.5929/2014.4.2.9>
- Hallin, K. (2014). Nursing students at a university — A study about learning style preferences. *Nurse Education Today*, 34(12), 1443–1449.
<https://doi.org/10.1016/j.nedt.2014.04.001>
- Hallin, K., Haggstrom, M., Backstrom, B., & Kristiansen, L. P. (2015). Correlations between clinical judgement and learning style preferences of nursing students in the simulation room. *Global Journal of Health Science*, 8(6), 1–13.
<https://doi.org/10.5539/gjhs.v8n6p1>
- Harder, N., Ross, C. J. M., & Paul, P. (2013). Student perspective of roles assignment in high-fidelity simulation: An ethnographic study. *Clinical Simulation in Nursing*, 9(9), e329–e334. <https://doi.org/10.1016/j.ecns.2012.09.003>
- Hart, P. L., Maguire, M. B. R., Brannan, J. D., Long, J. M., Robley, L. R., & Brooks, B. K. (2014). Improving BSN students’ performance in recognizing and responding to clinical deterioration. *Clinical Simulation in Nursing*, 10(1), e25–e32.
<https://doi.org/10.1016/j.ecns.2013.06.003>

Hayden, J. K., Smiley, R. A., Alexander, M., Kardong-Edgren, S., & Jeffries, P. R. (2014).

The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Nursing Regulation*, 5(2). [https://doi.org/10.1016/S2155-8256\(15\)30062-4](https://doi.org/10.1016/S2155-8256(15)30062-4)

Hober, C., & Bonnel, W. (2014). Student perceptions of the observer role in high fidelity simulation. *Clinical Simulation in Nursing*, 10(10), 507–514.
<https://doi.org/10.1016/j.ecns.2014.07.008>

Howard, S. (2017). *Comparison of satisfaction, self-confidence, and engagement of baccalaureate nursing students using defined observational roles and expectations versus traditional role assignments in high fidelity simulation and debriefing* (Dissertation, William Carey University). Retrieved from ProQuest Dissertations & Theses Global (10624882)

IBM. (2017). Statistical analysis software package - SPSS Statistics. Retrieved from <http://www-03.ibm.com/software/products/en/spss-statistics>

INACSL. (2017). Standards of best practice: Simulations: Operations. *Clinical Simulation in Nursing*, 13(12), 681–687. <https://doi.org/10.1016/j.ecns.2017.10.005>

Institute of Medicine. (2011). *The future of nursing: Leading change, advancing health*. Washington, DC: National Academies Press.

Jeffries, P. R. (2005). A framework for designing, implementing, and evaluating simulations used as teaching strategies in nursing. *Nursing Education Perspectives*, 26(2), 96–103.

- Kavanagh, J. M., & Szweda, C. (2017). A crisis in competency: The strategic and ethical imperative to assessing new graduate nurses' clinical reasoning. *Nursing Education Perspectives*, 38(2), 57–62. <https://doi.org/10.1097/01.NEP.0000000000000112>
- Kelly, M. A., Hager, P., & Gallagher, R. (2014). What matters most? Students' rankings of simulation components that contribute to clinical judgment. *Journal of Nursing Education*, 53(2), 97–101. <https://doi.org/10.3928/01484834-20140122-08>
- Lapkin, S., Levett-Jones, T., Bellchambers, H., & Fernandez, R. (2010). Effectiveness of patient simulation manikins in teaching clinical reasoning skills to undergraduate nursing students: A systematic review. *Clinical Simulation in Nursing*, 6(6), e207–e222. <https://doi.org/10.1016/j.ecns.2010.05.005>
- Lee, J., Lee, Y. J., Bae, J., & Seo, M. (2016). Registered nurses' clinical reasoning skills and reasoning process: A think-aloud study. *Nurse Education Today*, 46, 75–80. <https://doi.org/10.1016/j.nedt.2016.08.017>
- Lee, J., Lee, Y., Lee, S., & Bae, J. (2016). Effects of high-fidelity patient simulation led clinical reasoning course: Focused on nursing core competencies, problem solving, and academic self-efficacy. *Japan Journal of Nursing Science*, 13(1), 20–28. <https://doi.org/10.1111/jjns.12080>
- Levett-Jones, T., Hoffman, K., Dempsey, J., Jeong, S. Y.-S., Noble, D., Norton, C. A., ... Hickey, N. (2010). The 'five rights' of clinical reasoning: An educational model to enhance nursing students' ability to identify and manage clinically 'at risk' patients. *Nurse Education Today*, 30(6), 515–520. <https://doi.org/10.1016/j.nedt.2009.10.020>

- Liou, S.-R., Liu, H.-C., Tsai, H.-M., Tsai, Y.-H., Lin, Y.-C., Chang, C.-H., & Cheng, C.-Y. (2015). The development and psychometric testing of a theory-based instrument to evaluate nurses' perception of clinical reasoning competence. *Journal of Advanced Nursing*, 72(3), 707–717. <https://doi.org/10.1111/jan.12831>
- Marek, G. I. (2013). Impact of learning style assessment on self-reported skills of students in an associate degree nursing program. *Teaching and Learning in Nursing*, 8(2), 43–49. <https://doi.org/10.1016/j.teln.2012.11.001>
- Meehan-Andrews, T. A. (2009). Teaching mode efficiency and learning preferences of first year nursing students. *Nurse Education Today*, 29(1), 24–32. <https://doi.org/10.1016/j.nedt.2008.06.007>
- National League for Nursing. (2016). *Biennial survey of schools of nursing*. Retrieved from <http://www.nln.org/newsroom/nursing-education-statistics/biennial-survey-of-schools-of-nursing-academic-year-2015-2016>
- Pettigrew, A. C., Dienger, M. J., & O'Brien King, M. (2011). Nursing students today: Who are they and what are their learning preferences? *Journal of Professional Nursing*, 27(4), 227–236. <https://doi.org/10.1016/j.profnurs.2011.03.007>
- Plichta, S. B., Kelvin, E. A., & Munro, B. H. (2012). *Munro's statistical methods for health care research* (6th ed). Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins.
- Polit, D. F., & Beck, C. T. (2012). *Nursing research: Generating and assessing evidence for nursing practice* (9th ed.). Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins.

- Prithishkumar, I. J., & Michael, S. A. (2014). Understanding your student: Using the VARK model. *Journal of Postgraduate Medicine*, 60(2), 183–186.
<https://doi.org/10.4103/0022-3859.132337>
- Ray, S. R. (2017). *Issues related to implementing high-fidelity simulation in a nursing program* (Dissertation). Walden University.
- Robertson, L., Smellie, T., Wilson, P., & Cox, L. (2011). Learning styles and fieldwork education: Students' perspectives. *New Zealand Journal of Occupational Therapy*, 58(1), 36–40.
- Scherer, Y. K., Foltz-Ramos, K., Fabry, D., & Chao, Y.-Y. (2016). Evaluating simulation methodologies to determine best strategies to maximize student learning. *Journal of Professional Nursing*, 32(5), 349–357. <https://doi.org/10.1016/j.profnurs.2016.01.003>
- Schlairet, M. C., & Pollock, J. W. (2010). Equivalence testing of traditional and simulated clinical experiences: Undergraduate nursing students' knowledge acquisition. *Journal of Nursing Education*, 49(1), 43–47. <https://doi.org/10.3928/01484834-20090918-08>
- Schoessler, M., Brady, M., Engelmann, L., Larson, J., Perkins, I., & Shultz, C. (2012). Nursing judgment: Educating nurses to make decisions in practice. *Nursing Education Perspectives*, 33(6), 422.
- Secomb, J., McKenna, L., & Smith, C. (2012). The effectiveness of simulation activities on the cognitive abilities of undergraduate third-year nursing students: A randomised control trial. *Journal of Clinical Nursing*, 21(23–24), 3475–3484.
<https://doi.org/10.1111/j.1365-2702.2012.04257.x>

- Shinnick, M. A., & Woo, M. A. (2015). Learning style impact on knowledge gains in human patient simulation. *Nurse Education Today*, 35(1), 63–67.
<https://doi.org/10.1016/j.nedt.2014.05.013>
- Stegmann, K., Pilz, F., Siebeck, M., & Fischer, F. (2012). Vicarious learning during simulations: Is it more effective than hands-on training? *Medical Education*, 46(10), 1001–1008. <https://doi.org/10.1111/j.1365-2923.2012.04344.x>
- Tanner, C. A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education*, 45(6), 204–211.
- Thidemann, I.-J., & Söderhamn, O. (2013). High-fidelity simulation among bachelor students in simulation groups and use of different roles. *Nurse Education Today*, 33(12), 1599–1604. <https://doi.org/10.1016/j.nedt.2012.12.004>
- Tutticci, N., Coyer, F., Lewis, P. A., & Ryan, M. (2016). High-fidelity simulation: Descriptive analysis of student learning styles. *Clinical Simulation in Nursing*, 12(11), 511–521. <https://doi.org/10.1016/j.ecns.2016.07.008>
- Vizeshfar, F., & Torabizadeh, C. (2018). The effect of teaching based on dominant learning style on nursing students' academic achievement. *Nurse Education in Practice*, 28, 103–108. <https://doi.org/10.1016/j.nepr.2017.10.013>
- Whitman, B., & Backes, A. (2014). The importance of role direction in simulation. *Clinical Simulation in Nursing*, 10(6), e285–e289. <https://doi.org/10.1016/j.ecns.2014.02.008>
- Zulkosky, K. D., White, K. A., Price, A. L., & Pretz, J. E. (2016). Effect of simulation role on clinical decision-making accuracy. *Clinical Simulation in Nursing*, 12(3), 98–106. <https://doi.org/10.1016/j.ecns.2016.01.007>

Appendix A

Institution Review Board Approval

UMKC
5319 Rockhill Road
Kansas City, MO 64110
TEL: (816) 235-5927
FAX: (816) 235-5602

NOTICE OF EXEMPT DETERMINATION

Principal Investigator: Dr. Carol Schmer
UMKC School of Nursing and Health Studies
Kansas City, Missouri 64108

Protocol Number: 18-216
Protocol Title: Purposeful Simulation Role Assignment
Type of Review: Panel Manager Review
Exempt Category # 1

Date of Determination: 10/01/2018

Dear Dr. Schmer,

The above referenced study was reviewed and determined to be exempt from IRB review and approval in accordance with the Federal Regulations 45 CFR Part 46.101(b).

This study was determined to qualify under Exempt Category #1 as follows:

Research conducted in established or commonly accepted educational settings, involving normal education practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

This study was determined to qualify under Exempt Category #1 as follows:

Research conducted in established or commonly accepted educational settings, involving normal education practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

This determination includes the following documents:

Attachments

- ILS
- ILS Info
- NCRS Tool
- Permission to use NCRS
- Demographic Information
- Chapter 3_Methodology for IRB
- Letter of Support from BRCN
- Exempt Study Information
- Code Sheet-Blank
- Committee Approval

You are required to submit an amendment request for all changes to the study, to prevent withdrawal of the exempt determination for your study. When the study is complete, you are required to submit a Final Report.

Please contact the Research Compliance Office (email: umkcirb@umkc.edu; phone: (816)235-5927) if you have questions or require further information.

Thank you,

Appendix B

Letter of Support

Blessing-Rieman College of Nursing and Health Sciences

Institutional Review Board

Broadway at 11th • PO Box 7005 • Quincy, Illinois 62305-7005 • 217-228-5520

October 10, 2018

Erica Alexander, PhD, RN
Blessing-Rieman College of Nursing and Health Sciences
Quincy, Illinois

Dear Ms. Alexander,

The IRB at Blessing-Rieman College of Nursing and Health Sciences acknowledges the review of the study, *Purposeful Simulation Role Assignment*, by the University of Missouri- Kansas City IRB (Protocol Number 18-216) and accepts their approval of the study.

Karen Mayville, PhD, RN
IRB Chair

Appendix C

Demographic Information

Age in years: _____

Gender: _____

Degree: ADN or BSN

If BSN, indicate level in program. Sophomore Junior Senior

Previous simulation experience:

None 1-2 prior simulations 3-4 prior simulations 5 or more prior
simulations

Previous healthcare experience:

CNA/PCA LPN EMT/Paramedic Other(describe): _____

Appendix D

Index of Learning Styles*

Richard M. Felder
Barbara A. Soloman

DIRECTIONS

Enter your answers to every question on the ILS scoring sheet. Please choose only one answer for each question. If both “a” and “b” seem to apply to you, choose the one that applies more frequently.

1. I understand something better after I
 - a) try it out.
 - b) think it through.
2. I would rather be considered
 - a) realistic.
 - b) innovative.
3. When I think about what I did yesterday, I am most likely to get
 - a) a picture.
 - b) words.
4. I tend to
 - a) understand details of a subject but may be fuzzy about its overall structure.
 - b) understand the overall structure but may be fuzzy about details.
5. When I am learning something new, it helps me to
 - a) talk about it.
 - b) think about it.
6. If I were a teacher, I would rather teach a course
 - a) that deals with facts and real life situations.
 - b) that deals with ideas and theories.
7. I prefer to get new information in
 - a) pictures, diagrams, graphs, or maps.
 - b) written directions or verbal information.

* Copyright © by Education Designs, Inc., Cary, NC, USA. For information about the history of the ILS, the theory behind it, appropriate uses of it, and studies of its reliability and validity, see <www.ncsu.edu/felder-public/ILSpage.html>.

8. Once I understand
 - a) all the parts, I understand the whole thing.
 - b) the whole thing, I see how the parts fit.
9. In a study group working on difficult material, I am more likely to
 - a) jump in and contribute ideas.
 - b) sit back and listen.
10. I find it easier
 - a) to learn facts.
 - b) to learn concepts.
11. In a book with lots of pictures and charts, I am likely to
 - a) look over the pictures and charts carefully.
 - b) focus on the written text.
12. When I solve math problems
 - a) I usually work my way to the solutions one step at a time.
 - b) I often just see the solutions but then have to struggle to figure out the steps to get to them.
13. In classes I have taken
 - a) I have usually gotten to know many of the students.
 - b) I have rarely gotten to know many of the students.
14. In reading nonfiction, I prefer
 - a) something that teaches me new facts or tells me how to do something.
 - b) something that gives me new ideas to think about.
15. I like teachers
 - a) who put a lot of diagrams on the board.
 - b) who spend a lot of time explaining.
16. When I'm analyzing a story or a novel
 - a) I think of the incidents and try to put them together to figure out the themes.
 - b) I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.
17. When I start a homework problem, I am more likely to
 - a) start working on the solution immediately.
 - b) try to fully understand the problem first.
18. I prefer the idea of
 - a) certainty.
 - b) theory.

19. I remember best
 - a) what I see.
 - b) what I hear.
20. It is more important to me that an instructor
 - a) lay out the material in clear sequential steps.
 - b) give me an overall picture and relate the material to other subjects.
21. I prefer to study
 - a) in a study group.
 - b) alone.
22. I am more likely to be considered
 - a) careful about the details of my work.
 - b) creative about how to do my work.
23. When I get directions to a new place, I prefer
 - a) a map.
 - b) written instructions.
24. I learn
 - a) at a fairly regular pace. If I study hard, I'll "get it."
 - b) in fits and starts. I'll be totally confused and then suddenly it all "clicks."
25. I would rather first
 - a) try things out.
 - b) think about how I'm going to do it.
26. When I am reading for enjoyment, I like writers to
 - a) clearly say what they mean.
 - b) say things in creative, interesting ways.
27. When I see a diagram or sketch in class, I am most likely to remember
 - a) the picture.
 - b) what the instructor said about it.
28. When considering a body of information, I am more likely to
 - a) focus on details and miss the big picture.
 - b) try to understand the big picture before getting into the details.
29. I more easily remember
 - a) something I have done.
 - b) something I have thought a lot about.
30. When I have to perform a task, I prefer to
 - a) master one way of doing it.
 - b) come up with new ways of doing it.

31. When someone is showing me data, I prefer
 - a) charts or graphs.
 - b) text summarizing the results.
32. When writing a paper, I am more likely to
 - a) work on (think about or write) the beginning of the paper and progress forward.
 - b) work on (think about or write) different parts of the paper and then order them.
33. When I have to work on a group project, I first want to
 - a) have “group brainstorming” where everyone contributes ideas.
 - b) brainstorm individually and then come together as a group to compare ideas.
34. I consider it higher praise to call someone
 - a) sensible.
 - b) imaginative.
35. When I meet people at a party, I am more likely to remember
 - a) what they looked like.
 - b) what they said about themselves.
36. When I am learning a new subject, I prefer to
 - a) stay focused on that subject, learning as much about it as I can.
 - b) try to make connections between that subject and related subjects.
37. I am more likely to be considered
 - a) outgoing.
 - b) reserved.
38. I prefer courses that emphasize
 - a) concrete material (facts, data).
 - b) abstract material (concepts, theories).
39. For entertainment, I would rather
 - a) watch television.
 - b) read a book.
40. Some teachers start their lectures with an outline of what they will cover. Such outlines are
 - a) somewhat helpful to me.
 - b) very helpful to me.
41. The idea of doing homework in groups, with one grade for the entire group,
 - a) appeals to me.
 - b) does not appeal to me.
42. When I am doing long calculations,
 - a) I tend to repeat all my steps and check my work carefully.
 - b) I find checking my work tiresome and have to force myself to do it.

43. I tend to picture places I have been
- a) easily and fairly accurately.
 - b) with difficulty and without much detail.
44. When solving problems in a group, I would be more likely to
- a) think of the steps in the solution process.
 - b) think of possible consequences or applications of the solution in a wide range of areas.

Appendix E

Nurses Clinical Reasoning Scale

The NCRS measures self-perceived nursing clinical reasoning ability. The scale contains 15 items with higher score indicating self-perceived higher level of clinical reasoning ability. There are no reverse questions. The total score is to sum all item scores. Below is the scale.

Directions: Please read each item and circle the number that best describes your current performance. There is no right or wrong answer.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. I know how to collect an admitted patient's health information quickly.	5	4	3	2	1
2. I can apply proper assessment skills to collect a patient's current health information.	5	4	3	2	1
3. I can identify abnormalities from the collected patient information.	5	4	3	2	1
4. I can identify a patient's health problems from the abnormal information collected.	5	4	3	2	1
5. I can recognize possible early signs or symptoms when a patient's health deteriorates.	5	4	3	2	1
6. I can explain the mechanism and development associated with the early signs or symptoms when a patient's health deteriorates.	5	4	3	2	1
7. I can accurately prioritize and manage any identifiable patient problems.	5	4	3	2	1
8. I can correctly explain the mechanism behind a patient's problems.	5	4	3	2	1
9. I can set nursing goals properly for the identified patient problems.	5	4	3	2	1
10. I can provide appropriate nursing intervention for the identified patient problems.	5	4	3	2	1
11. I am knowledgeable of each nursing intervention provided.	5	4	3	2	1
12. I can identify and communicate vital information clearly to the doctors based on the patient's current condition.	5	4	3	2	1
13. I can anticipate the prescription ordered by the doctor according to the patient information provided.	5	4	3	2	1
14. I can accurately evaluate and identify whether a patient's condition is improved.	5	4	3	2	1
15. I know the follow-up steps to take if the patient's condition does not improve.	5	4	3	2	1

Appendix F

Permission to use Nurses Clinical Reasoning Scale

Subject: Re: Nurses Clinical Reasoning Scale

From: ChingYu (chingyuus@gmail.com)

To: efar3d@mail.umkc.edu;

Date: Monday, February 12, 2018 7:14 PM

Yes you have our permission to use the NCRS in your study. The attached is the scale and information about the NCRS can be found in the article (DOI: 10.1111/jan.12831). Please do remember to cite the article whenever you publish your studies.

Good luck to your study. Chingyu

Ching-Yu Cheng, PhD, RN
Professor
Chang Gung University of Science and Technology
email: chingyuus@gmail.com

efar3d@mail.umkc.edu

Erica Alexander

Appendix G

Student Observation Guide

Be prepared to discuss the following items during the debriefing.

What went well during the simulation?

What safety concerns did you observe?

How could the care provided during the simulation be improved?

Appendix H

Intervention Protocol

Research Steps	Completed By
During a class period prior to the simulation experience:	
Students informed of the study and invited to participate in the study.	Research Assistant
Consent obtained and baseline data (Demographic Sheet, ILS, and NCRS) collected.	Research Assistant
After initial data collection but prior to the simulation experience:	
Participants randomly assigned to experimental or control group.	PI
Simulation roles assigned based on assigned group. (See role assignment detail below.)	PI
Day of simulation experience:	
Simulation roles provided to all students.	Faculty member other than PI
Simulation and debriefing completed.	Simulation and clinical faculty
Post-test data (NCRS) collected.	Faculty member other than PI

Role Assignment Detail

Simulation Role	Role Description	Experimental Group (Role Congruent with Learning Style)	Control Group (Role Not Congruent with Learning Style)
Direct Care Provider	Provide direct patient care following scope of practice of RN.	Active Learner	Reflective Learner
Observer	Observe the simulation experience. Identify what went well and areas for improvement. Provide feedback regarding this information during the debriefing.	Reflective Learner	Active Learner

VITA

Erica Fay (Rauman) Alexander was born in Joliet, Illinois in 1977. Her family relocated to Liberty, Illinois in 1985. Ms. Alexander attended school in Liberty, graduating from Liberty High School in 1995. After graduating high school, Ms. Alexander attended Culver-Stockton College (CSC) in Canton, Missouri and Blessing-Rieman College of Nursing (BRCN) in Quincy, Illinois. She earned her Bachelor of Science in Nursing degree from CSC and BRCN in 1999.

After graduation, Ms. Alexander began her nursing career in the Intensive Care Unit at Blessing Hospital in Quincy, Illinois. After four years, Ms. Alexander had the opportunity to become the staff educator for the Intensive Care Unit as well as several other nursing and ancillary departments. It was in this position where she discovered her love of education. In 2005, Ms. Alexander was approached about an opportunity to work on the team that was implementing the use of an electronic medical record at Blessing Hospital. In this position, Ms. Alexander assisted with the implementation of the electronic medical record by working with staff to determine and meet their documentation needs. In addition, Ms. Alexander led the staff training related to the implementation of the electronic medical record. During her time as a nurse informaticist, Ms. Alexander began attending BRCN where she earned her Master of Science in Nursing in 2011.

In January 2010, Ms. Alexander began teaching full-time at BRCN. Her initial teaching responsibilities included teaching senior level clinical. In August 2011, Ms. Alexander was able to combine her love of education and technology and became the

Simulation Center Coordinator at BRCN. She was responsible for implementation of the college's simulation center. She remains in this position today.

In 2013, Ms. Alexander earned certification as a nurse educator through the National League for Nursing. She has also been nominated three times for the Daisy Faculty Award (2013, 2015, 2017). Ms. Alexander has presented her research related to nursing students' anxiety related to sudden patient death at both the local and national level. In addition, she published an article related to this work in the journal *CIN: Computers, Informatics, and Nursing*. After completing her Doctor of Philosophy degree, Ms. Alexander plans to continue her research in nursing education, striving to find the most effective ways to increase students' ability to critically think.